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Clearing Skies

SUDDENLY, the sun seems to be peeping out from behind the cloud that has been hanging over British air transport. Of late the scene has been more in shadow than in light, or so it has seemed to a nation whose strength is self-criticism, and whose weakness—if it is a weakness—is self-esteem.

We may be mistaken: the wind may change or other clouds gather. But we might just allow ourselves to lean momentarily on our spades and review with a calm eye a scene which, though not all sweetness and light, does appear more cheery.

In doing so, we recognize the dangers of over-simplification, of taking too rigid a view of "the future pattern," which—as in other departments of human activity—is woven as much by chance as by man-decreed acts. Supposing the U.S.A.F. had not wanted big jet tankers? There might have been no talk today of the "600 m.p.h. jet transport plateau."

But we do not think that the tribunal of history will adjudge us wrong if we submit that the most significant development in British air transport since the Comet is B.O.A.C.'s order for the VC-10 medium-jet, the joint private venture of the Vickers-Armstrongs and Rolls-Royce team. The dizzy sequence of political posturings, about-turns and somersaults which have characterized B.O.A.C.'s equipment policy for two years past seems ended at last, and suddenly everyone can stop arguing about what the Corporation should or should not buy.

—and Broadening Horizons

In the VC-10 we see many lessons of the past applied. Take the size of the order: 35 aircraft. The mind boggles at the capacity this adds to the large fleets of 707s, Britannia 312s and Comet 4s which B.O.A.C. already has on order. It suggests, according to the sums we did last week, that the Corporation is planning on truly prodigious increases in Britain's at-present declining total share of international air transport. And the presence of a strong B.O.A.C. team in South America, an area in which Britain's traffic rights have lain neglected for three years past, suggests that the Corporation means to make good use of every capacity ounce-inch it has on order. The size of the VC-10 contract also portends real clear-the-decks action at Weybridge and Derby.

Take the design itself. Few details have been released, but the VC-10 will clearly be the class of aeroplane for which the world's operators are likely to pay out a great deal of money during the next ten years. The big-capacity, medium-range, high-subsonic class of jet will have a distinct place of its own alongside the 707 and DC-8, and this one is timed to appear when the airlines will have recovered their breath from the exertions of introducing the big jets.

There are other causes for guarded satisfaction. One is Britain's strength as a supplier of turboprop transports for every major category of transport: long-range Britannia (for which a new export order is announced), medium-range Vanguard, short-range Viscount, freight-carrying A.W.A. 650, local-service Dart Herald, executive Accountant. There is Rolls-Royce's domination of the transport turbine-engine market: Dart and Tyne, Avon and Conway—all chosen to power eight out of the ten new European and American turbine transports on the market. There is, too, real Ministerial awareness of the fact that the country's private airlines must have a bigger share of expanding world traffic, and we hear that promising new recommendations have been laid before Mr. Watkinson by the Air Transport Advisory Council. There are also R.A.F. Transport Command's sharpened responsibilities for giving wings to Britain's mobile strategic reserve, with the attendant implications for the industry's transport order-books.

And B.E.A., notwithstanding last week's "embarrassment" with the flag, have done, and are doing, a great deal for the nation's share of air transport and in establishing its products. We have the feeling that B.E.A. are not as allergic to jets as they have professed in the past, which may mean that another marketable airliner —the 600 m.p.h. short-haul jet will be just that—is discernible in the distance.

We have preened enough. Now back to the spade.

FROM ALL QUARTERS

V-Bombers Claim Mach 1

IN the course of a test flight in Victor XA 917 about a fortnight ago—it has since been disclosed—the appearance of a red warning light in the cockpit during a shallow dive momentarily distracted the attention of the crew and, while they investigated, two of the members noticed that the Machmeter registered fractionally over Mach 1. At the same time several members of the Handley Page company near Radlett heard a loud sonic boom; it was heard, also, in Southern Hertfordshire. The Machmeter was subsequently calibrated, and it is claimed that its indication was accurate and that the Victor exceeded the speed of sound at about 40,000ft by about 15 m.p.h. There was apparently no other instrumentation aboard which would prove this claim conclusively. The boom provides strong circumstantial evidence.

The crew on this flight consisted of J. W. Allam (pilot) with Mr. G. Wass (flight observer) in the co-pilot's seat, and Mr. P. Langston in a rearward-facing seat (probably the first man to have exceeded the speed of sound while facing backwards). Flights at speeds very close to this value are regularly made in the Victor, but the contract does not specify sonic speeds.

Subsequently a spokesman of the Hawker Siddeley Group made the claim that the Vulcan had on several occasions exceeded Mach 1. Elaborating this statement, an Avro spokesman said that the Machmeter had on several occasions registered over Mach 1, but that it was not claimed that the Vulcan had exceeded the speed of sound. During one particularly fast, but still subsonic, flight the Vulcan sustained damage and its wing had to be re-skinned.

Seaslug

LAST week the Admiralty issued their first full news-release on Seaslug, the ship-to-air weapon which the Royal Navy is to procure in quantity. The following is a slightly shortened text of the statement.

"Seaslug is the medium-range weapon which the Parliamentary Secretary to the Admiralty (Mr. Christopher Soames) informed the House of Commons, during the debate on the Navy Estimates, is designed to engage any enemy bomber which evades the fighter defences of the Fleet. It will do so at any height at which modern aircraft are capable of operating.

"The first ships in which Seaslug will be fitted are the four guided-weapon destroyers which have already been ordered by the Admiralty. These ships are to be based on the *Daring* class, but will be larger. Seaslug is operated and fired from positions within a ship without any personnel being required to be on duty in exposed places. Although a large number of officers and men are engaged in the maintenance of the missile equipment and in preparations for firing, the number engaged in the actual operation of firing is far smaller than the crew of a conventional gun turret in a major warship.

SEASLUG, a ship-to-air guided missile by Armstrong Whitworth, is to be the Royal Navy's standard weapon in this class. Here a Seaslug is being fired from H.M.S. "Girdleness" during recent sea trials.

VICTOR XA 917, which may well be the first aircraft of its size to have exceeded Mach 1 (see news item on left).

"Targets are detected at long range by radar, and subsequently plotted accurately for range, height and bearing. From this information a particular aircraft may be selected as the target for the missile. The details of the target's range, course and speed are obtained by the missile guidance and control system and used to position the weapon launcher, and enable the operator to determine when to fire the missile. Missiles are fired from a triple ramp launcher automatically fed from a magazine below decks.

"All seaborne equipment, apart from the missile itself, has been developed under the direction of the Admiralty; this includes the launcher, magazine handling gear, radar and associated weapon-direction and control equipment.

"Naval interest in guided weapons started during World War 2 and the Royal Navy were leading protagonists of the guided weapon during the period 1943-1949. During the war an Admiralty committee was set up to investigate means of providing the British Pacific Fleet with a short-range guided weapon to deal with the Japanese Kamikaze suicide attacks, but Japan was defeated before the project was sufficiently advanced. After the war the Ministry of Supply became responsible for guided-weapon development. The naval requirement for guided weapons was restated and eventually the first Service contract was awarded by the Ministry of Supply to the Hawker Siddeley Group, who in turn chose Sir W. G. Armstrong Whitworth Aircraft, Ltd., as the co-ordinating contractor.

"Other firms intimately associated with the development of this weapon system are: The General Electric Co.; Sperry Gyroscope Co., Ltd.; John Thompson Conveyor Co.; Sir Geo. Godfrey and Partners; Vickers-Armstrongs, Ltd.; Metropolitan Vickers, Ltd.; McMichael Radio, Ltd.; E.M.I. Engineering Development, Ltd.; Imperial Chemical Industries."

Farnborough, 1957

PRELIMINARY information has been given by the Society of British Aircraft Constructors on their 18th Flying Display and Exhibition, to be held at the R.A.E., Farnborough, between September 2 and 8.

The show promises to be the biggest and best yet; last year a record total of 338 firms occupied an exhibition building of 111,150 sq ft floor area; this year the building is being reconstructed to cover 125,400 sq ft, providing room for more than 350 stands. "Guided weapons," say the Society, "will figure prominently." Weather permitting, the Royal Air Force will contribute "novel and interesting" items to the flying display, which will also—for the first time—include aircraft of the Fleet Air Arm.

Exports Still Rising

BRITISH aircraft exports during April totalled £8,474,779, the fifth highest figure ever recorded in a single month and almost £¾ million up on the total for April, 1956.

Aircraft and parts accounted for £5,344,521, engines £2,660,071, electrical parts and appliances £285,104, tyres £45,343 and instruments £139,740. Sweden was the best cus-

***FIRESTREAK*—the air-to-air guided weapon by de Havilland—is the standard R.A.F. missile of its class. One of these potent weapons, carried by a Gloster Javelin, is here being inspected at Leuchars by the Queen and the Duke of Edinburgh (see story on page 814). The weapon is being explained by W/C. Romanis.**

tomer, with £1.3 million worth of aircraft and parts, followed by India (£701,728), Lebanon (£418,865), Canada (£398,129), France (£248,245) and Netherlands (£199,880). Australia, Belgium and the United States were also considerable buyers.

The total for the first four months of this year amounted to £32,769,755, representing an annual rate of £100 million. During this period engines accounted for £11.7 million worth, almost £3 million more than in the same period in 1956. Sweden has now gained a narrow lead over the United States as Britain's best customer in 1957, with £3.6 million worth of aircraft and parts, as against £3.5 million.

In spite of the deferment of Capital Airlines' order for their remaining 15 Viscounts—delivery of which would have begun in April—the export rate has been maintained at a high level.

Bristol Retirements

TWO well known senior members of Bristol Aircraft, Ltd., have retired at the age of 65 after long service with the organization. One is Mr. H. J. Pollard, Wh. Ex., F.R.Ae.S., director and chief engineer (35 years' service) and the other is Mr. H. W. Dunn, A.F.R.Ae.S., design and administration engineer (34 years).

Mr. H. J. Pollard.

Mr. H. W. Dunn.

Mr. Pollard, who is widely known throughout the aircraft industry, was primarily responsible for the pioneer work carried out at Filton in the twenties and thirties on metal-aircraft construction. His development of methods of fabricating high-tensile-steel strip and, later, aluminium alloy was an important factor in the success of such classic Bristol aircraft as the Bulldog, Bombay and "Britain First," precursor of the Blenheim-Beaufort-Beaufighter line.

After an apprenticeship with Mather and Platt of Manchester he worked as a draughtsman at Willans and Robinson of Rugby, next as an airframe stress calculator for Vickers Limited, and then as assistant aircraft designer for Boulton and Paul.

In 1922 he joined the Bristol Aeroplane Company as engineer-in-charge of metal-aircraft projects and played a leading part in introducing a system of high-tensile steel construction, first incorporated in the Boarhound. The famous "Britain First" monoplane, with its principal wing members of formed steel strip and fuselage and tailplane covered with aluminium-alloy sheet, was one of the first strictly all-metal (except for moving surfaces) aircraft to be designed and built as such in this country. Only 12 months elapsed from its conception to its first flight in 1955.

Mr. Pollard was appointed production manager in 1934, works manager in 1938 and general manager (aircraft factories) in 1943. In 1947 he became chief development engineer, responsible for materials and structures. He was appointed a member of the aircraft divisional Board in July 1944, a director of the Weston Company in July 1946, and a director of Bristol Aircraft, Ltd., on its formation in 1955.

Mr. Dunn, after training with a firm of consulting engineers, joined Frederick Sage and Co., Ltd., who were building aircraft during the First World War, in 1917. Among his colleagues there were Mr. E. C. Gordon England, who had been a designer at Filton in 1911-12, and Mr. Clifford Tinson, who had worked as assistant to Capt. Frank Barnwell and who returned to the Bristol design team in 1922.

Mr. Dunn joined Bristol in 1923 as a senior draughtsman, subsequently becoming an assistant to Mr. L. G. Frise. In 1930 he visited Japan with Mr. Frise to help in the planning of a Tokyo factory which was to build Bulldog-type fighters under licence. While there, he supervised the construction of the only two which the Japanese works eventually produced.

Returning to this country in 1934, he was made chief draughtsman and in 1939 became drawing office manager. After the war there was a new expansion in the drawing office staff, and in 1945 Mr. Dunn was appointed design administration engineer, in charge of the general administration of the aircraft design organization. He was also responsible for the formation and organization of the Aircraft Company's new drawing offices in London and Bournemouth.

***STUDENT*—the new jet trainer by F. G. Miles, Ltd.—looks well in this first air-to-air picture. The Mark III version will have a Rolls-Royce or Turboméca turbojet of about 1,400 lb thrust.**

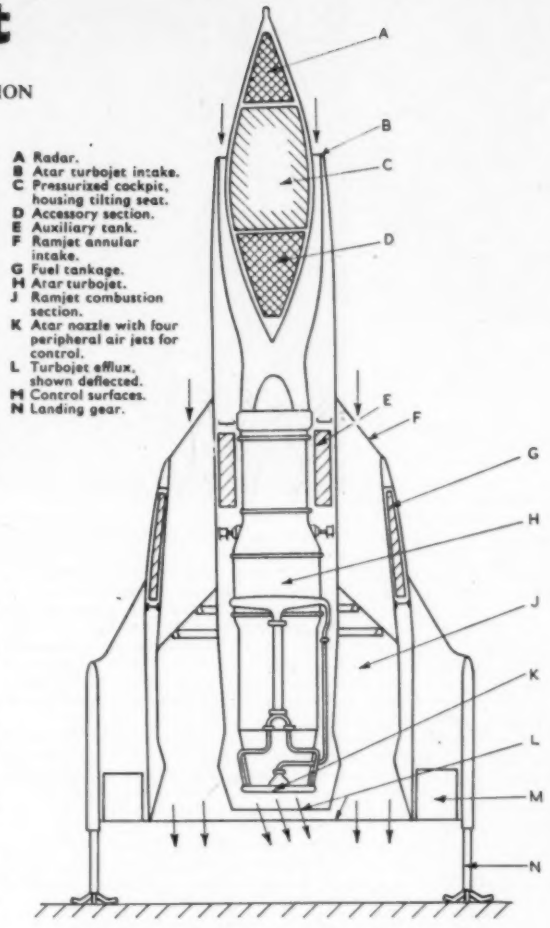
Atar Volant

TRUTH STRANGER THAN SCIENCE FICTION

TWO years ago, in our issue of June 24, 1955, we published an exclusive, comprehensive appraisal of the "coleopter" type of aircraft developed by the Bureau Technique Zborowski. To many, this concept of a family of tail-standing, VTO, annular-wing machines must have seemed more akin to science fiction than to serious work worthy of support with substantial outlays of public money. Such is by no means the case, for the French government are now supporting the development of the concept with an eventual view to the realization of practicable weapon systems and transport vehicles.

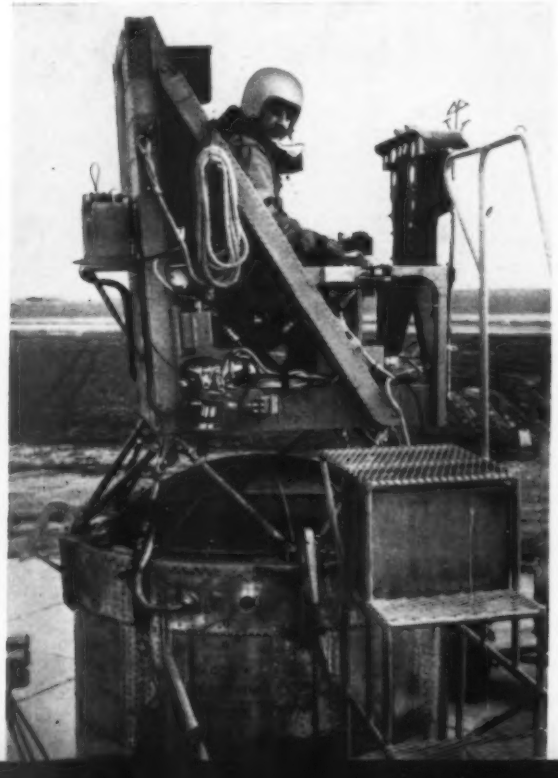
Much of the fundamental research work has been assigned to S.N.E.C.M.A., the great French nationalized aero-engine company. They have undertaken extensive tunnel research into several species of coleopter and have now completed the first stage of flight-test development, to the following programme: 1954, tethered flight of a remotely controlled VTO model equipped with a S.N.E.C.M.A. Ecrevisse pulsejet of 100 lb thrust; 1955, vertical rig tests of an Atar oil system; gimbal-rig tests on the effectiveness of Atar jet-deflection devices; mobile bench investigations into ground effect; 1956, first tests on a remotely-controlled gimbal mounted Atar Volant (C-400 P-1) with gyroscopic control; start of remotely-controlled tethered trials with the Atar Volant to investigate stabilization and influence of wind; 1957, start of flight trials of the piloted Atar Volant C-400 P-2, including an official test on April 8 and free (i.e., untethered) flying on the airfield at Melun from May 14 onwards.

There are actually three types of Atar Volant. The P-1 is a remotely-controlled device comprising an Atar DV turbojet rated at 6,393 lb thrust and controlled through electric signal cables. The P-1 has completed more than 250 flights under the remote command of two pilots, MM. Servanty and Morel (S.N.E.C.M.A. chief test pilot). The P-2 is generally similar but carries a pilot ejection seat above the air intake and an instrument panel and controls. Annular tanks surrounding the compressor of the Atar contain a total of 1,100 lb of fuel, sufficient for more than four minutes' flight at sea level. Take-off weight is 5,730 lb (90 per cent of the thrust of the Atar at peak r.p.m.). The P-3, which is now under construction, will be equipped with a vertical Atar E of some 7,700 lb thrust and will be equipped with a tilting ejection seat inside an enclosed cockpit. It will not have lifting surfaces and so will be restricted to flight in substantially vertical attitudes, but will serve to hasten development of the optimum cockpit for the definitive coleopter capable of flight both vertically and horizontally.


A Radar.
B Atar turbojet intake.
C Pressurized cockpit, housing tilting seat.
D Accessory section.
E Auxiliary tank.
F Ramjet annular intake.
G Fuel tankage.
H Atar turbojet.
J Ramjet combustion section.
K Atar nozzle with four peripheral air jets for control.
L Turbojet efflux, shown deflected.
M Control surfaces.
N Landing gear.

Simplified cross-section of a coleopter intercepter.

(Left) S.N.E.C.M.A. test pilot Auguste Morel seated some 22ft from the ground on the Atar Volant (Flying Atar) C-400 P-2.



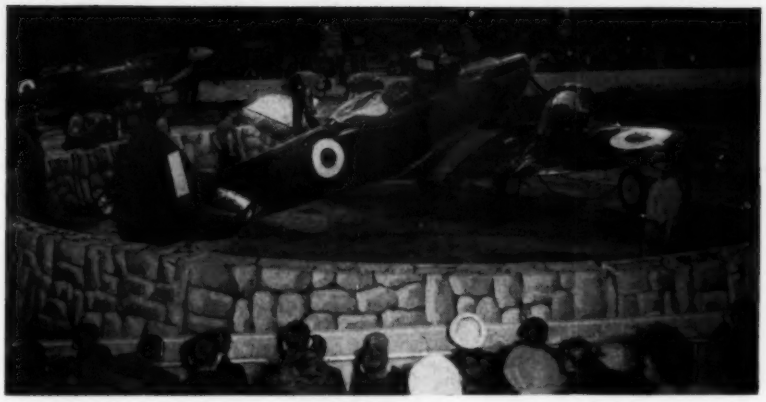
Airframes for complete prototype coleopters are at present being constructed at Chatillon-sous-Bagneux by S.N.C.A. du Nord. We present here a cross-section of a typical intercepter coleopter with Atar power. As the diagram shows, the annular wing is used to form the outer wall of an integral ramjet surrounding the centrally mounted Atar. Control at low forward speeds is obtained by deflecting the efflux from the Atar by high-velocity jets of compressor-bleed air expelled through four slots arranged around the main propelling nozzle. In addition there are four compressor-bleed jets mounted tangentially on the ends of radial pipes, to provide directional control about the vertical axis, i.e., the major axis of symmetry.

Compared with conventional aircraft such a device would be more compact and would present far less acute structural problems. Moreover, it would have true VTOL ability yet could readily be designed to have high supersonic level speed. One of the few disadvantages is that there is not a great deal of internal volume for the fuel; but it is, nevertheless, possible to visualize point-defence functions for which the endurance of such a machine (perhaps five minutes at full power) would be adequate. In this context it is worth pointing out that dead-stick landings are impossible.

S.N.E.C.M.A. have European rights to military annular-wing applications. They also have certain other interests in the coleopter, and are reported to be planning a multi-purpose vehicle driven by ducted fans powered by one or more General Electric T58 shaft turbines.

Meanwhile the original B.T.Z. organization has now been re-constituted as a joint-stock company (the Société Anonyme Bureau Technique Zborowski) who have a new building at 1/3 Avenue d'Orléans, Brunoy, S. et O. During the past two years the B.T.Z. has investigated the pilotless intercepter Charançon VI, followed by the improved Charançon VIII with a Bristol Orpheus 3, as well as the Hanneton III-A touring aircraft and numerous surface- or air-launched guided missiles.

HERE AND THERE



ALL BUT FLOWN: Two Spitfires—which taxi into the arena under the power of their Merlins—are armed and refuelled during the "Malta G.C." setpiece at the Royal Tournament, which continues at Earls Court, London, until June 22. The nearer aircraft is an L.F.IXE.

Yugoslavian Gnats?

THE managing director of Folland Aircraft, Mr. W. E. W. Petter, was in Belgrade last week to discuss possible sale or production of the Gnat in Yugoslavia.

Woomera Rumour Denied

AUSTRALIA's Minister of Supply, Mr. Beale, has described as "without foundation" rumours that Britain was considering the removal of all her nuclear and guided-missiles testing facilities from the Woomera Range to Christmas Island.

Orenda Production Award

AT the recent annual general meeting of the Canadian Aeronautical Institute, Earle K. Brownridge was presented with the 1957 McCurdy Aviation Award. Mr. Brownridge is vice-president, manufacturing, of Orenda Engines, Ltd., and the honour was in recognition of his "conception, introduction and development of manufacturing methods used in the Orenda production programme." The award was presented personally by the Hon. J. A. D. McCurdy, who in 1909 made the first powered flight in Commonwealth.

Major M. E. A. Wright

A MEMORIAL service to Major Maurice Wright was held at Christ Church, London, W.1, on June 6. The Rev. Howard Marshall officiated, and an address was given by Sir Frederick Handley Page. A.V-M. W. L. Freebody represented the Air Council and the Royal Air Force, while the Minister of Supply was represented by Mr. K. W. Matthews and the Ministry by Mr. S. O. Norman. Major Wright, a director of the Fairey Aviation Company for 32 years, died on April 27.

FIRST OF 50: The first two Sycamores for the Luftwaffe left Bristol's Weston factory on May 31 for Germany. They will be used for ambulance work, air-sea rescue and general transport duties.

SCIMITAR—the new fighter/bomber for the F.A.A.—demonstrated at Le Bourget by Lt-Cdr. M. J. Lithgow. It was announced on that occasion that the machine can be used for reconnaissance or can carry mines. Note in this "Flight" photograph that the nosewheel is seen to be "cocked."

Bristol's B.E.47

ANNOUNCED thrust for this advanced and efficient turbojet is now 6,000 to 8,000 lb. The previous figure was 6,000 lb.

The Blackpool Run-Down

AT a meeting last week of the North-West Regional Board it was stated that a further 500 workers at Hawkers' Blackpool factory may be laid off by mid-July.

Atlantic Beeches

TWO Beech L-23 (Twin Bonanza) liaison aircraft of the U.S. Army are scheduled to fly the Atlantic this month to evaluate the feasibility of flight delivery of Army aircraft to Europe. The L-23s will have extra tankage giving an ultimate range of 1,600 miles, and will take four days for the flight to Germany *via* Labrador, Greenland, Iceland and Scotland.

Ice and No Ice

A RECENT report, quoted in these pages, contained a reference to the work of the Falklands Islands expedition in surveying "40,000 square miles of the world's most southerly ice-free area." The statement was a misleading one, but the true facts can be found in an article published on pages 802-805 of this issue.

Christmas Island

Background to "Operation Grapple"

"1777 December Wednes. 24. On the 24th, about half an hour after daybreak, land was discovered . . . it was found to be one of those low islands so common in this ocean . . ."

—Log of Capt. James Cook (then Lieut.), R.N.

SINCE it was discovered by Captain Cook almost 180 years ago, Christmas Island, in the centre of the Pacific Ocean, has been sporadically used as a resting-place for the crews of whalers and —not very successfully—as a place to grow coconuts on a commercial scale. Although some 35 miles by 24 miles in extent it has remained almost continuously uninhabited.

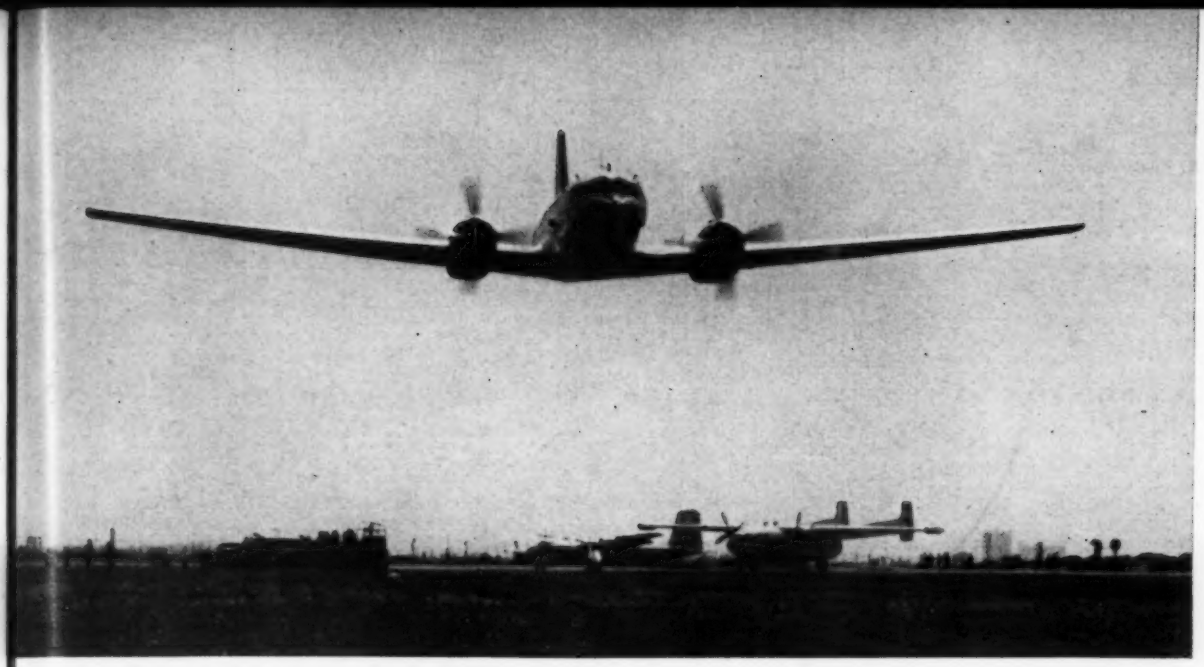
Uninhabited, that is, until American troops arrived in 1942. Then almost 10.000 men descended on the island and dredged a channel into the lagoon and built airstrips for bombers and fighters. And now the island has served as the base from which the first British megaton weapons have been tested.

All three Services have been heavily committed to "Operation Grapple," as the tests are known. The Army, for example, had to build, from scratch, a considerable township with seaport and airbase, together with mains electricity, "company's water" (distilled from the sea); sewage and hygiene services; and all logistic provisions for a population of 2,300. The Royal Navy had two prime commitments: to establish port facilities and bring in all seaborne stores, provisions and fuel and, secondly, to provide weather ships and technical and operational control in the Forward Area near Malden Island, some 400 miles to the south of Christmas Island.

From the Royal Air Force came 49 Sqn. (Valiants) to drop the weapons themselves; No. 76 Sqn. (Canberra B.6s) to do atomic-cloud sampling at all altitudes; 100 Sqn. (Canberra P.R.7s) to undertake multiple photographic tasks; 206 and 240 Sqns. (Shackletons); 22 Sqn. (Whirlwinds); and a host of transport aircraft, Auster A.O.P.9 (for pest control) and other types.

Many of the aircraft had to be modified. The Valiants were fitted with black-out shutters to protect the crew, and certain parts of the airframes were strengthened to withstand the heat of the nuclear explosion; the Canberra B.6 samplers were provided with filters in their cabin-air systems and cooling ducts, together with radiation dose-meters to record crew-exposure. In addition, a tremendous amount of effort resulted in the perfection of special cooling trollies, new maintenance and repair techniques and "advanced navigational equipments" (to quote an official statement).

Air-and-ground crews of a Valiant hold an informal pre-flight conference. In the heading picture Valiants are seen being serviced and below is a general view of the airfield, with Valiants, Hastings and Shackletons of the Task Force.



The Avia 14 (two M82T engines)—"a much modernized, thoroughly efficient, over-sized Anson"—demonstrating at Le Bourget on June 1.

COSMOPOLITAN QUARTET

An Opportunity to Sample Four Contrasting Aircraft—Czech, German, Italian and French

By C. M. LAMBERT

INTRODUCING his Paris-Show-Week diary last week, the author wrote: "There can be nothing in the world quite like the Paris Show. During the exhibition week that culminates in the final comprehensive flying demonstrations it is a free-for-all of demonstration flying, joy-riding and general more or less serious aeronautical amusement." Here he gives detailed appraisals of four contrasting aircraft which he was able to fly during his busy week. He begins with the Czech Avia 14.

DURING show week I was taken for two flights in the Avia 14, which is the Czech version of the Russian Il-14. Maximum seating capacity is normally 32, but this particular machine had 22 seats, four abreast and widely spaced. Décor consisted of salmon pink on walls and ceiling, with dark brown plastic beading, and brown seats and carpeting. The crew compartment was predominantly drab green and black, but with a card-table-green floor covering. There was none of the Russian chandelier-and-damask atmosphere.

Galley and forward freight compartment took up a great deal of space and the passenger cabin did not start till just forward of the wing leading edge. The flight deck was also ample and arranged for two pilots, a flight engineer on a jump seat, and two radio operators behind them. Radio equipment and flight instruments were all Russian and included a normal blind-flying panel, dual A.D.F., I.L.S., two 26-channel V.H.F. sets, dual H.F. radio and radio altimeter. The autopilot was apparently of 1945 vintage but newly made. There was a certain amount of cabin ventilation, full heating, but no pressurization.

The Avia 14 gets off from Le Bourget. "The take-off run, at about full load, takes 15 seconds . . ."

"Flight" photograph

The brochures advertise the Avia 14 as a medium-range transport for use from short unimproved fields. I appreciated what this statement meant when I saw how two French and two Czech pilots handled the aircraft. The take-off run, at about full load, takes fifteen seconds, during which the passengers are aware of the snarl of the 1,700 h.p. engines. At other times the soundproofing keeps a commendably low noise-level throughout the aircraft at both climbing and cruising power settings.

Soon after take-off all the crew seemed to be smoking cigars and, while the pilots examined the Paris scenery with great interest, the two radio operators listened intently to their equipment. When the pilot cut the starboard engine and made quite steep turns in both directions, there appeared to be no great out-of-trim forces to take up. With 2,000 r.p.m. on both engines and a boost reading of "8"—which I could not fathom—we cruised at 156 m.p.h. with a full passenger load. Visibility upwards from the pilots' seats did not appear too wide, but downwards the extra lower side-windows gave an excellent view of the ground.

The Czech pilot opened his clear-vision side-window several times, letting in welcome blasts of cool air to clear the cigar smoke. All the crew seemed to be greatly enjoying their flight over Paris while the French pilot flew the aircraft. We finally reached Toussus, by way of SHAPE headquarters and St. Cyr airfield (these aroused great interest), and went into a steep, fast dive. We descended at about 250 m.p.h. with the pilots animatedly discussing the scenery until I thought they might have forgotten about pulling out. But we made an exceedingly low pass and roared up into a very steep wing-over. For the Avia 14 this sort of thing is a piece of cake.

We drove back over Sacré Coeur and Concorde while the crew continued sight-seeing and then prepared for a low pass at Le Bourget. This time we reached ground-level at 300 m.p.h. and pulled up hard into an extremely steep climb. In the ensuing wing-over at 1,800ft the Czech pilot put down wheels and flap at 144 m.p.h. Thereafter he made a tight, fighter-type approach

The Dornier Do 27 (Lycoming GO-480 engine). Its flying characteristics are ". . . as distinctive as its appearance." "Flight" photograph

COSMOPOLITAN QUARTET . . .

with a very steep descent indeed. The pilot called for full flap, and the increased drag made me hold on to a support as I knelt behind the jump seat. We rolled off bank and touched down at 94 m.p.h. and ran for about 400 yd, using plenty of the very assertive, toe-operated powered wheel-brakes.

I thought this landing, and a similar one we made on another flight, showed particularly well the characteristics of the Avia 14. It really is designed for short rough fields and could go into very small spaces. It does not pretend to be a Convairliner, although it looks very like one. I would compare it rather to a much modernized, thoroughly efficient, oversized Anson. Galley, toilet, full blind-flying and radio-navigation equipment, in addition to a very reasonable performance and excellent handling, make the Avia 14 a most useful machine for use in relatively undeveloped areas. This particular example was going to China immediately after the Paris show.

The Czech pilot's name is, I think, well worth remembering. It is Kaustik.

Dornier Do 27. On the first Sunday of the show, watching Herr Schäfer give his amazing demonstration in the Dornier, I felt a strong urge to make closer acquaintance with this aircraft. Schäfer took off in the strong wind and climbed pretty well vertically up to about 1,000ft. Flicking over almost on to his back, he roared down again and went through a series of manœuvres which demonstrated the amazing low-speed handling qualities of the aircraft. He ended his demonstration with a landing with the propeller stopped, drifting down very slowly, with all the flappery hanging down, and wagging the Dornier's tail 30 or 40 degrees to each side. Rumour had it that he was always on the look-out for thermals to soar in. With three passengers the Do 27's performance seemed little affected.

I first talked to Herr Klaudius Dornier, the eldest son of the business, and heard what his company is doing. To date some 25 Do 27s have been built, some of them "Bs" with dual control, but mostly "As" with single control for the German army. Production is building up to 15 a month at the end of this year and the price is between 115,000 and 120,000 Deutschemarks (about £10,000). The engine is a Lycoming 270 h.p. with constant speed propeller. Since its Spanish days the airframe has been "productionized" and the fuselage contour has been slightly altered. The whole airframe is built up round a strong floor-structure which carries the single main frame holding the torsion-box wing and the engine. A single post in the middle of the sharply swept windscreen serves as a crash pylon. Both windscreen panels are themselves upward-opening doors, to which one climbs over the wheels and on a footstep on the undercarriage leg, using the door-support strut as a convenient handle.

The monocoque tail is attached to the floor and anchored by two built-up beams from the main wing frame. The cabin itself is, therefore, very little encumbered by structure and two large rectangular glazed side-doors give easy access. Four passengers, or two NATO standard-size stretchers, can be carried comfortably in this space. (The Czech Agricolta, which is of about the same size, carries two of the smaller stretchers and its performance is not quite so impressive as that of the Dornier.)

The Do 27 has a top speed of 156 m.p.h., cruising speed of 125 m.p.h. on 60 per cent power, and a cabin, aft of the pilots' seats, 6ft 10in long, 4ft 3in wide and 4ft 5in high—a volume of 124 cu ft. The minimum speed is given as 35 m.p.h.

Herr Dornier said the machine was particularly designed not for slow flying but for safe manœuvring at very low speeds; and Schäfer really showed me in no uncertain way how successful the designers have been in their work. Indoctrination started with that staggering take-off and almost vertical climb—at just over 40 kt indicated. We sailed up at 1,000ft/min with the engine noisily hauling us straight into the clear blue sky. Though the cowling slightly obstructed forward vision on the ground, it was not obtrusive in the air; visibility sideways, forwards and rearwards (through the glazed roof) was good, and downwards it was virtually uninterrupted—so much so that at times it gave me a slight feeling of vertigo.

A novel feature is that the back-rest of the co-pilot's seat swivels. The pan slides backwards and forwards, but the rudder pedals are not adjustable. Steering on the ground is by toe-brakes, but in later aircraft the tailwheel will be steerable. After take-off we continued out over the green fields east of Le Bourget. I took over and got the feel of things, finding the machine very pleasantly stable at cruising speeds and extremely steady and manageable at very low indicated speeds. Then Schäfer took it, cut the engine and hauled the machine into an almost vertical climb. Looking over at me, he said he could pull the stick right back to the stop; and as we went up at a horrifying angle, with the speed firmly dropping off, he banged it there to show me. I was ready to say my prayers when the aircraft finally seemed set for a tail-slide, but . . . very slowly . . . the nose dropped over forwards and we fell into a steep dive. There was no buffet and no wing-drop—in fact, no sign of protest from anything or anyone but myself. We then did it again—several times. I tried to stall it out of a steep turn. When I thought we must be close to it, Schäfer pulled on full flap with the great handle between the seats and the turn tightened up sharply. Again he hauled the stick back, but there was not a tremor from the aircraft. The machine can, in fact, be flown slowly enough, straight and level, to stop the propeller—I saw the pilot do it.

There are three flap settings: 12, 26 and 42 degrees. Schäfer's favourite was 26 deg, and he applied it mostly at the top of that almost vertical climb before winging over for another look at something he had just passed. He could get 1,000 ft/min climb at 30 kt I.A.S. and swing the tail backwards and forwards as if he were trying to see round the further side of the engine cowling. He spotted some farm-hands working in a hayfield, plonked the aircraft down right next to them, and took off again after a total run of less than 100 yd. We found a small airfield and put on a real tail-swinging and zooming demonstration for a group of French people who came running out of the hangars and offices.

I took over again for the cruise back to Le Bourget. Horizontal tail trim is effected by varying the incidence of the tailplane with a very low geared (but very large) trim-wheel. Having flown the Otter, which has a similar system, I thought of setting the tailplane at about half forward position, about two degrees, and throttling back and extending flaps to see whether there was much elevator control left. There was enough for normal control, but probably not enough for landing. With all trimming arrangements of this kind it is important to see that stick forces are trimmed out for the landing, so that the elevator will not be overpowered by the tailplane at the critical round-out phase. In addition to very effectively cancelling trim changes caused by the high-lift system and powerful engine, a variable-incidence tailplane can cope with a very wide range of c.g., allowing relatively careless loading of the cabin.

Schäfer showed me the standard approach method for the Dornier 27. The engine is throttled back and flap extended. (Ailerons, incidentally, are in two sections on each side, the inner portion drooping progressively as the flaps come down.) The approach is made in a glide at 45 kt I.A.S., with the nose almost above the horizon. If the tail is then swished from side to side, the visibility is greatly increased and the rate of descent will build up to 1,000 ft/min. There is plenty of aileron control and the machine can be lowered down on to a given spot with a burst of throttle to cushion the impact. There is a distinct feeling that

the aircraft is being put down vertically rather than driven towards the point of touch-down at an angle. The landing is rather noisy—the tailwheel clatters a good deal—but the run is extremely short. We rolled straight towards the Westland Widgeon, which was standing in the corner of Le Bourget from which we were operating, and stopped well before we got there.

The outstanding feature of the Do 27 is its slow-flying behaviour. It is not only fully manœuvrable at 40 kt, keeping an ample reserve of power for an immediate climb, but it is actually pleasant to handle under these conditions. It really feels absolutely right to be stooging along at 40 kt, casually watching one's shadow amble across the fields underneath. The stick can be pulled straight back to the stop and, provided the tailplane is not seriously out of trim, nothing untoward will happen. The turning circle is remarkably small, and is very greatly decreased by application of flap. The Do 27's flying characteristics are, in fact, as distinctive as its appearance.

After the flight Klaudius Dornier told me that since the war he had deliberately avoided high-speed aircraft, and he expressed great interest in the M.L. Utility, with its inflatable wing, and in the Fairey Ultra Light helicopter, which he much admired. He was also particularly eager to see Edgar Percival's E.P.9, apparently regarding it as an important competitor to the Do 27.

Falco. I would say without any hesitation that the Italian Aviamilano Falco is the finest light aircraft I have flown—a real pilot's machine, a small fighter and a two-seater fit for kings to show their ladies. It has gorgeous lines. But it is no quirk, no "hot ship". It is a superb completely equipped little aeroplane, fully aerobatic, but with plenty of room for baggage and radio equipment; and a cruising speed, on 140 h.p., of 168 m.p.h.

Handling it is sheer delight. In a previous article Vico Rosaspina, who made all the test flights, said he considered it pretty well perfect, but this perfection has to be experienced before it can be fully appreciated. I flew the Falco with Léon Biancotto, winner of last year's aerobatic championships at Coventry, and was shown some aerobatics and did some myself. In all manœuvres the aircraft is finger-light, yet will fly hands-off without any trouble. It is not in the least what the French would call *nerveux*—too sensitive. In flying it one has to get used to just two things, keep only two fingers lightly resting on the stick, and use the right amount of rudder in the turns.

Undercarriage and flap operation are controlled by switches and full night-flying lighting is installed, together with generator and V.H.F. radio. The nosewheel is steered by the rudder pedals and both hydraulic disc brakes are operated simultaneously from a single heel pedal between the rudder bars.

Since the non-standard fixed-pitch propeller was fitted to this machine, 2,000 r.p.m. only were available on take-off and we made about 660ft/min rate of climb at full load on a hot day, flying at 93 m.p.h. after unsticking at 62 m.p.h. The machine is very small, and visibility through the large tear-drop, sliding canopy is all one could wish. The wooden structure is plywood covered, this in turn being covered with fabric and finished with 15 coats of paint overall, resulting in a magnificent gloss. The undercarriage is fully covered by fairing plates when retracted, so that drag is reduced to a minimum.

After climbing to 1,100ft we levelled off and let the speed build up. We got 168 m.p.h. at 2,350 r.p.m. with a goodly sound of air rushing over the canopy and a healthy noise from the engine. I did some steep turns and loops and rolls, really enjoying the precise and instant response of the aircraft to all control movements. I was impressed by the excellent stability. Then Biancotto showed me a stall. With the aircraft clean, and engine throttled back, he raised the nose. At about 80 m.p.h. there was a decisive buffet, followed, at 75 m.p.h., by a straight dropping of the nose. Release of stick pressure produced complete recovery by the time the nose was back to the horizon. One could not wish for a more docile stall.

Under that large canopy it was rather warm in the bright sunlight, but the top section was tinted and two well-placed ventilators in the sides of the windscreen did much to keep us cool. On the ground the hood can be locked about one inch open, to give extra ventilation, by not over-centering the "pop-bottle" canopy lock. At no speed did the canopy rattle or appear loose.

On the way back to Le Bourget we tried the maximum level speed and settled at 181 m.p.h. It should not be forgotten that we had only 140 h.p. and a fixed-pitch wooden propeller. In the circuit Biancotto lowered wheels and flap at 100 m.p.h. and made a curved approach at that speed. The rate of descent was 1,200 ft/min. We touched down at 81 m.p.h. and dropped the nosewheel straight away. The landing run was quite short.

I am the more impressed by the Falco since it is in full production in Italy and the machine I flew in was not a carefully-prepared prototype. A batch of eleven is now to be produced under licence in France and enquiries have been received from America.

Fouga Magister. Offered the chance of making a flight in the French Fouga Magister, I took it right away. The air force trainer version was proposed as being more representative of the latest control standard than the naval version. The new undercarriage and sliding hood, they told me, were not really so noticeable as the improved ailerons.

M. Jacques Grangette, the Fouga test pilot, was to fly with me and he kindly let me sit in the front seat. I was completely briefed on the machine and prepared to start up and manage the whole flight myself but, after take-off, the control tower asked for a demonstration by Grangette, so I did not make the eventual landing.

I found that the Magister felt very similar to the Jet Provost, although the French machine has considerably higher speed capabilities and is fully equipped for armament training. The Fouga company considers that it is suitable for basic and intermediate training and that it would carry a pupil through both Jet Provost and Vampire trainer stages right into the O.C.U. armament phase. In addition, the machine offers the safety of two engines with the handling characteristics of a single-engined installation. Grangette did in fact cut an engine on me at a normal cruising speed; except for a steady reduction in speed there was absolutely no effect. Single-engined overshoots are quite straightforward.

One could argue till the cows come home about the relative merits of tandem and side-by-side seating. Grangette seemed quite able to see what I was doing in the front seat; and I had myself seen, during a flight two years ago, that the periscope in the back gives ample visibility for daytime landings and armament work. Many instructors are probably still too conscious of the difficulty of guiding a pupil during a night landing in a trainer like the Harvard, where visibility from the back was anything but good under those conditions.

The Magister is in general an electro-hydraulic aircraft and services are mainly operated by switches and very small levers. There are more circuit-breakers than can be pressed down with the flat of the hand, but they are all grouped together. The starting procedure is simple and the switches normally turned on when starting are all grouped together. Instrumentation is complete and good, based on French instruments which are rapidly gaining a very high reputation. Twelve-channel V.H.F. radio with a single-

The Falco (Lycoming O-290 engine)—"a real pilot's machine, a small fighter and a two-seater fit for kings to show their ladies."

COSMOPOLITAN QUARTET . . .

channel standby and radio compass are standard and the relevant controls are all grouped on the starboard console. Paired power-levers have a twist-grip for gunsight ranging and carry the three-position, self centering air-brake switch recessed in one end. Air-brake retraction and extension takes 1.2 seconds, during which time the switch must be held on. Thus any degree of air-brake can be selected, and some may be inadvertently left out until one gets used to holding the switch a little longer than usual.

Toe brakes are fitted and are used for steering on the ground. They are powered and extremely effective. On this occasion a non-standard rudder pedal made them rather uncomfortable. Since fuel injection into the engines is by centrifugal force from the turbine shaft, there is only a low-pressure cock for each engine. The lever has the lighting-up button in its head and re-lighting is therefore easy. An acceleration control is fitted so that the power levers can be slammed open or jerked back and forth without any fear of trouble. Engine response to lever movement is very rapid and can be very distinctively felt.

Since 19 minutes are needed for the climb to 30,000ft and, as we were short of time, we did not make a Mach run, but the characteristics are apparently very good. The limit is officially just over 0.8 M (400 kt at low altitude) but each individual Magister is tested well beyond this figure.

The control column grip is of the standard French intercepter type (made by S.A.M.M.) and many of the push-buttons on it are not used in the Magister. But the trim rocker switch which lies under the thumb in its normal position is very comfortable, and the electric elevator trim is very well adjusted for response. In flight, I could find no characteristic peculiar to the vee tail and did not notice it at all. In contrast with bigger jet aircraft, turns in the Magister have to be co-ordinated with rudder and this control is light.

I found the Magister very pleasant to fly. It was easy to maintain an accurate climbing speed and the ailerons have now been made more effective than those of the first machines. They are firm and responsive; not light and sharply effective like those of the Jet Provost. Trim changes were mostly associated with speed, rather than with changes in power setting or configuration. Aerobatics were extremely pleasant. In rolls there was no excessive tendency to fall away in the last 90 degrees; and loops, starting at 300 kt, were very smooth. There was plenty of speed left at the top for a roll-off without the need for pulling heavy g at the beginning. I later pulled four g quite comfortably and noticed no buffeting or other effects.

I tried a couple of stalls in the dirty configuration. They came at below 80 kt with a distinct warning buffet and a decided dropping of the nose. I thought a spiral tended to develop if the stick was held back, but recovery started as soon as rearward pressure on the stick was released. At about 80 kt the machine remained under precise control. The trim range was sufficient to damp out all forces at these speeds. It is normal to make the final approach at 95 kt with the air-brakes out. The glide-angle can be made creditably steep and the landing run with brakes is very short.

"Flight" photograph

The Fouga Magister (the Type 175M "navalized" version) in action at Le Bourget. The turbojets are two Turboméca Marboré IIs.

When we returned to Le Bourget Grangette gave a very spirited demonstration, at low level from the back seat, making rolls off very low passes and a fine six-point hesitation roll which is his speciality. He said he played it a little coolly because he was not used to aerobatting from the back seat; but the manœuvres were so low that I was quite sufficiently impressed for my own comfort.

While we were standing off before the demonstration I played with the air-conditioning system. Cabin temperature is directly controllable and I managed to get it from cold to hot in a matter of seconds. It took a little longer to cool off again. There is also a flood-flow setting for demisting. I liked the size of the cockpit. Everything came readily to hand and was well labelled, and dials were easily readable. But some customers are apparently asking for ejector seats; and that may possibly make things a little tight.

I think Fouga will have more trouble convincing people in favour of the tandem seating than in demonstrating that the aircraft can indeed cover the whole training range from basic to operational conversion. The tandem layout gained an unnecessarily bad reputation in piston-engined aircraft, but the old disadvantages are not to be found in the Magister. I have a feeling that the decisions of the various users will be made rather more on grounds of economics than on consideration of the various qualities and characteristics.

PROGRESS IN PLASTICS

HELD concurrently with the 1957 British Plastics Exhibition (July 10-20) at Olympia, London, the fourth British Plastics Convention will take place on July 11-17. Papers describing some of the more important developments in materials and processing in the plastics industry will be presented by speakers from Germany and the United States as well as from the United Kingdom. Details of the papers are as follows:—

Polyolefins (Thursday, July 11, 10.30 a.m.): *Synthesis and Properties of Olefin and Diene Polymers*, by C. G. Overberger and H. F. Mark, Polymer Research Institute, U.S.A.; *Some Aspects of Low-pressure Polythenes*, by Erhard Grams, Farbwerke Hoechst AG., Frankfurt, Germany.

Polythene (Thursday, July 11, 2.30 p.m.): *Light Scattering of Polythene in Solution*, by P. B. McFarlane, F. Yearsley and S. W. Hawkins, Imperial Chemical Industries, Ltd., Alkali Division; *Permeability of High-Density Polythene Films*, by V. T. Stannett, State University of New York; *Stress Cracking in Polythenes*, by James A. Reid, Phillips Petroleum Co., U.S.A.

Polyvinyl Chloride—1 (Friday, July 12, 10.30 a.m.): *The Physical Properties of Lightly Plasticized P.V.C. Compounds*, by R. A. Horsley, B.X. Plastics, Ltd.: *Foamed Polyvinyl Chloride*, by D. A. Lever and G. Burke, British Geon, Ltd.

Polyvinyl Chloride—2 (Friday, July 12, 2.30 p.m.): *High Impact Vinyl Materials*, by Clarence E. Parks and G. B. Jennings, B. F. Goodrich Chemical Co., U.S.A.

Extrusion—1 (Monday, July 15, 11 a.m.): *Some Aspects of Low Pressure Polythene Pipes*, by Hermann Paul, Chemische Werke Hüls, Germany.

Extrusion—2 (Monday, July 15, 2.30 p.m.): *Some Recent Developments in Extrusion*, by A. Kennaway, Imperial Chemical Industries; *Developments of Extrusion in Germany*, by G. Schenkel, Paul Troester Maschinenfabrik, Germany.

Injection Moulding—1 (Tuesday, July 16, 10.30 a.m.): *The Influence of Preplasticization in Injection Moulding*, by E. Gaspar and M. G. Munns, Projectile and Engineering Co., Ltd.

Injection Moulding—2 (Tuesday, July 16, 2.30 p.m.): *The Significance of Injection Rate in Moulding*, by L. W. Meyer and L. E. Tallman, Dow Chemical Company, U.S.A.; *A Study of Injection Moulding of Toughened Polystyrene*, by G. Hulse and A. Z. Borucka, Monsanto Chemicals, Ltd.

Material Developments (Wednesday, July 17, 10.30 a.m.): *Recent Developments in Fluorine Polymers*, by G. W. Bowley, Imperial Chemical Industries; *Recent Developments in Arc Resistant Thermosetting Moulding Materials*, by J. Hofton and C. P. Vale, B.I.P. Chemicals.

Glass-reinforced Plastics (Wednesday, July 17, 2.30 p.m.): *Relative Merits of Epoxide, Phenolic and Polyester Resins in Glass Reinforced Plastics*, by L. H. Vaughan, Bakelite, Ltd.; *Reinforced Plastics for Efficient Structures*, by W. A. Baker, Bristol Aircraft, Ltd.

"FLIGHT" PHOTOGRAPHS

MANY of the photographs reproduced in *Flight*, i.e., those taken by our own photographic staff (as indicated on publication) are subsequently available in the form of high-quality prints. Prices are as follows (dimensions given in inches): 5½ × 3½, 1s 4d (glossy or semi-matt, unmounted), or 2s (toned sepia, unmounted); 6 × 4, 2s 6d or 4s; 8 × 6, 3s 6d or 5s 6d; 10 × 8, 5s or 7s 10d; 12 × 10, 6s or 9s 8d; 15 × 12, 9s 6d or 13s; 20 × 16 (semi-matt only), 13s or 18s.

Also available are a postcard series, totalling over 200, depicting both historic and modern aircraft of the R.F.C., R.N.A.S., R.A.F. and Fleet Air Arm. A list of this card series is obtainable on application. Prices are 8d each card, or 7½d each for quantities of a dozen or more. One view only—in most cases a good three-quarter front or side—is available for each aircraft type.

The Giant at Hartford

Some Notes on Pratt and Whitney Aircraft

THE sub-title above could be misleading, since the business of Pratt and Whitney Aircraft (of East Hartford, Connecticut, a division of United Aircraft Corporation) concerns not aircraft but aero engines. For many years they have been the world's largest company specializing in this field and their recent progress has been phenomenal.

As is well known, they eased themselves gently into the gas-turbine business by mass-producing Americanized and developed versions of Rolls-Royce centrifugal turbojets, while maintaining substantial production on advanced piston engines. At the same time (1945 onwards) they made a few small axial turbojets of Westinghouse design and also designed and ran an axial turboprop for the U.S. Navy, designated T34. This programme allowed their research staff to make full use of the company's tremendous research facilities between 1948 and 1950 in the development of a completely new generation of split-compressor axial turbojets in the 10,000-lb-thrust class. The first of the new family, the J57, has now been flying for six years and is used in more than half the American military aircraft in bulk production. Pratt and Whitney and the Ford Motor Company at Chicago have between them turned out more than eight thousand J57s to date.

Five years ago the company decided to scale up the J57 to produce the 15,000-lb-thrust J75. This unit is of fundamentally later design, has a better power/weight ratio and is only fractionally larger than its predecessor. It is already in full production for the U.S. Air Force and Navy. At the other end of the scale is the J52, which is a J57 scaled down to a dry thrust of 7,000 to 7,500 lb. This engine is coming into production for the U.S. Navy. As an insurance for the future there are the J58 high-airflow engine for the Navy and the low-temperature nuclear J91, the latter associated with the Air-Force Weapons System 125A.

Turboprop development has not been unsuccessful either. The T34 is in full production for the U.S. Air Force and the much larger T57, of more than 15,000 e.h.p., is performing excellently during its advanced testing programmes.

Piston-engine production is still being maintained at a high rate, and Pratt and Whitney are also major contractors in the development of aircraft propulsion systems drawing heat from nuclear power. With financial and constructional help from the U.S.A.F. and Army Corps of Engineers the Company is well advanced with a $50m nuclear research and production plant stretching for more than two miles along the Connecticut River near Middletown. In this work Pratt and Whitney are teamed with Lockheed's Georgia Division, who will make the airframe.

On paper, many of the current Pratt and Whitney powerplants seem unduly heavy or bulky, and one might expect other American engine firms to do better. In fact the reverse has happened. More than at any previous time the Connecticut company dominates the American aero-engine scene; and, at a rough assessment, it receives seven out of every ten dollars spent by the U.S. Government on aircraft powerplants.

When last we visited East Hartford Mr. Leonard S. "Luke" Hobbs, now vice-chairman of United Aircraft, outlined his company's plans for the future. General Electric, he said, "will push us the hardest and the fastest," and certainly that company's series of variable-stator engines are proving very advanced pieces of engineering. Nevertheless, Pratt and Whitney are extremely sound engineers and a shrewd and conservative company. They have reaped a great harvest from Air Force and Navy planners who have similarly inclined towards conservatism in ordering "the best engines" from the viewpoints of absolute reliability and proven operational efficiency—irrespective of weight/thrust ratio, capital cost or manufacturing complexity.

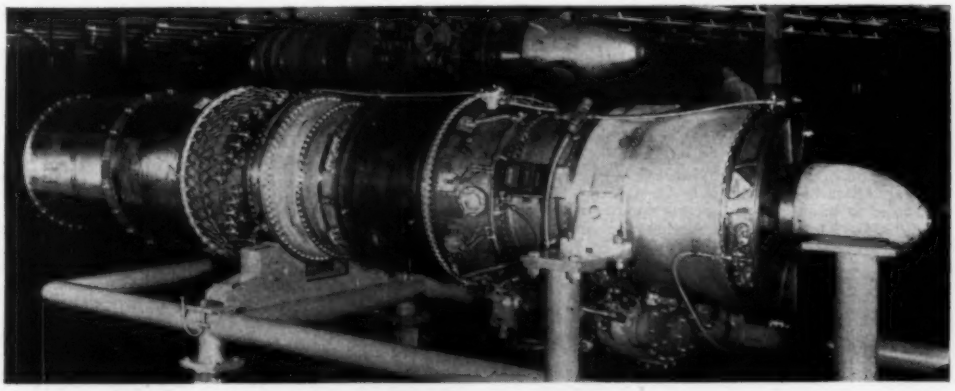
This is a production J75 turbojet of some 16,000 lb thrust. Most of the J75s being built have afterburners, for use in the Republic F-105, Convair F-106, Chance Vought F8U-3 or Martin P6M-2.

In fact, the performance of the J57 during its first million Air Force hours has been exemplary, and even the severely-used afterburning engines of the supersonic fighters are rapidly working up to an overhaul life better than that of previous U.S.A.F. fighter axials. A vast amount of data has been published on the logistic aspects of the operation of the J57, and typical figures for B-52 operations are 234 man-hours for field repair and 1,052 man-hours (plus roughly 173 man-hours for inspection) during Air Materiel Command overhaul. The T34, powerplant of the C-133, is at present overhauled on a 750-hr basis and is proving most reliable.

It is hardly surprising that Pratt and Whitney have swamped all other American engine firms in the race for the civil jet market. More than 90 per cent of the Boeing 707s and DC-8s currently on order will be sold with Pratt and Whitney engines. Even though the number of aircraft involved is small compared with the company's military business, it is likely to expand appreciably during the next few years, and it is also appropriate to point out that a set of four engines of the JT4A type (J75) with spares costs well over $350,000.

During 1956 Pratt and Whitney increased their labour force by 3,000 to a total of roughly 40,000, of whom the majority are concerned with the manufacture of the J57. During the same year the back-log of orders of the parent United Aircraft reached the tremendous total of 2.3 billion dollars, an increase of some 900m dollars in twelve months.

There are many men in Washington who are not entirely happy about the situation, and would like to see a more even distribution of engineering talent and commercial business among the five "giants" of the U.S. aero-engine industry. At the moment, however, the giant at Hartford has walked off with almost three-quarters of the business, and certainly no one would suggest that the American free-enterprise system should not be allowed to run its ruthless course.



First application of the J52 turbojet is the Douglas A4D-3 Skyhawk of the U.S. Navy. The J52 shown on the right has a short afterburner with curious staggered rows of fuel-injection points. In the background is a T34 turboprop, of 6,000 h.p., used in the C-133 transport (also a product of Douglas).

RIDING THE JETSTREAM

The Lockheed L.1649A in T.W.A. Service

FOR T.W.A. to name (and register) their new Lockheed L.1649A Starliner services "Jetstream" was a calculated gimmick. The inauguration of the service has been accompanied by a considerable promotional effort, with the airline trying to convey that here is a stepping-stone to the next generation of turbine-powered airliners. Certainly the L.1649A is the most long-ranged airliner now in service, and it may be regarded as the ultimate in the Constellation line.

But the demarcation between T.W.A.'s Jetstreams and their 707s is certain to be sharply defined. Development is a cyclic process that is continued to exhaustion point or until it is superseded by a new idea. Lockheed's L.1649A is the last stage of the old cycle. The shapely Constellation fuselage has been progressively stretched; the power of the Wright Turbo-Compounds increased to a total of 13,600 b.h.p. for take-off; the diameter of the Hamilton Standard propellers increased (to 16ft 10in, the largest on any transport); and the nacelles moved outboard along the new, straight-tapered, 150ft-span wing (a notable structure largely made of integrally machined panels and permitting tankage space for nearly 8,000 Imp. gal, permitting a full-payload range, with reserves, of up to 5,000 st. miles). The result is a transport of true transatlantic capabilities; and it will be used to establish T.W.A.'s California-to-London polar flights when C.A.B. approval is obtained.

Ten L.1649As of 25 on order had been delivered when T.W.A. began the transatlantic service on June 1. The same name is used for all of T.W.A.'s L.1649A flights—a coast-to-coast mixed (30 first-class, 34 tourist) trans-American service, and 74-seat all-tourist services from New York to London and Frankfurt, or to Paris and Rome. The transatlantic services will build up to a midsummer peak of 42 per week by July 26; there will be 30 a week in June and 36 in July.

On domestic flights, first-class passengers are treated to the hedonistic pleasures of the "Ambassador" service, with the amenities of a newly designed galley, a mural-decorated "Starlight lounge," and a central sleeping compartment with four upper and four lower bunks. The interior of the Jetstream has received considerable attention and, in line with the current vogue, specialist assistance has been enlisted in its design. The result (as *Flight* was able to sample on a "second inaugural" flight from London to Frankfurt last week) is imaginative and restful. The over-riding colour is a pale coffee-brown, used for the walls, roof and racks. The touch of the styling consultant is evident in the multiplicity of colours—cream Vinyl for the seat arms, khaki head-rest covers, gold "Lustrex" threaded mustard-coloured pockets on the seat backs and seat covers, and pastel-green curtains. Or, in the more exotic language of the consultants: "Sun-touched gold, soft bittersweet and azure."

The all-tourist layout is divided into three compartments, with a total of 74 seats. Each compartment is divided by veneer-faced bulkheads. There are four toilets, two being aft of the front compartment and a further pair at the extreme rear. Particularly neat are the grouped punkah louvres and reading lights; the punkahs are of the new miniature type with a centre-button adjustment by which the direction and flow of the airstream can be much better controlled.

Comparing noise-levels by ear is like comparing drinks: the only easy method is to sample several, one after the other, though the end result is likely to be a worse confusion than existed at the beginning. Moving the engines of the L.1649A outboard and the reduction in prop' r.p.m. is claimed to have resulted in reduced noise level, and at cruising power, certainly, the level of decibels is pleasantly unobtrusive. There is naturally more shaking and vibration at take-off power, though not enough to cause even mild discomfort to the senses, and in any case take-off power is of brief duration.

On the long wing of the L.1649A, the Fowler-type flaps, protected with chordwise rubbing strips, extend outboard to the ailerons. They take about 25 sec to retract, which they do to the accompaniment of a slight judder; there is no noticeable sink.

The cockpit is similar to that of the Super G Constellation. On the 418-mile flight to Frankfurt, the crew were kept fairly busily engaged tuning the A.D.F. to the beacons on airway Green One—a process which they regarded with disfavour after the less pressing workload of the transatlantic stage from New York. As each new range was flown, the Bendix autopilot (with height-lock and I.L.S. coupler) was disengaged and the Jetstream aligned to the new course, but the captain found time to demonstrate the action of the weather radar display stowed beneath the floor behind the small control console. The panels are folded back and the scope hinged up into position. A feature of the L.1649A—and of T.W.A. Super Gs—is the prominent black nose dome for the weather-radar scanner.

Apart from the captain and second pilot, the remaining space in the rather small cockpit is occupied by the flight engineer. At his elbow is the scope of the engine ignition analyzer; the complex patterns on the tube—which can be tuned to any plug of any engine—can be interpreted from an analysis manual. Just before our trip this well-known Sperry device had proved its worth at New York, when a faulty distributor cap was analyzed and much valuable time saved in snag-finding on the ground. Among the engine-management duties of the flight engineer is the synchronization of the EA-2 Turbo-Compounds, and in this his work-load is simplified by electronic servo operation.

The handling characteristics of Lockheed's latest reflect the changes in design. The high-aspect-ratio wing is quite flexible, and the ride is less "hard-sprung" than that of the Super G. Improved lateral control results from better ailerons and increased stability makes the machine pleasanter to fly (the controls are, of course, powered).

Some aircraft are classic from the start. In their declining years, long in the tooth and past their days of commercial economy, they are regarded with well-merited affection. Development may spoil the original character, but a special reverence attaches to the last of a line. The L.1649A is a transition aircraft. The well-designed interior, the modern flying aids and the long range capabilities will be found increasingly in the generation to follow.

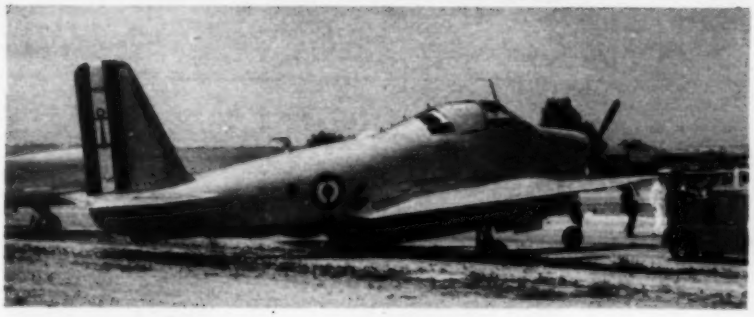
As with many new aircraft entering service, the L.1649A is having a series of minor teething troubles and delays. *Flight*'s return flight from Frankfurt was postponed into the dreary early morning hours of Rhein-Main's airport lounge by a leaking brake seal on one aircraft and a defective propeller governor on another. But in its years of service ahead, the last of Lockheed's line of piston-engined transports may well be judged by passengers as the most popular of them all.

The next airline to get L.1649As will be Air France, who have ten on order. L.A.I., a T.W.A. associate (see news item below) have four on order, and Lufthansa have also bought four. Lockheed's L.1649A orderbook now stands at 43 aircraft.

T.W.A. TO WITHDRAW FROM L.A.I.?

TRANS WORLD AIRLINES may, according to an American source, give up its holding in Linee Aeree Italiane in return for some of the four Lockheed L.1649As which the Italian airline has on order. (T.W.A. is to have 25.) Such a decision might be related to the impending merger, previously reported on these pages, between L.A.I. and Alitalia.

T.W.A. hold 40 per cent of the shares in L.A.I., the remainder being held by Italian interests. It will be recalled that B.O.A.C. and B.E.A. have holdings in Alitalia, but no indication of how these interests will be reconciled with the impending merger between the L.A.I. and Alitalia has been given.



Two new, and important, French aeroplanes with British gas turbine powerplants: top, the Dassault Etendard VI, with Bristol Orpheus; below, one of the three Bréguet Alizé anti-submarine aircraft (Rolls-Royce Dart) now flying. A hundred have been ordered.

AIRCRAFT INTELLIGENCE

Great Britain

Bristol 200. According to *American Aviation* this new high-speed jet airliner project is powered by four B.E.47 turbojets each of 6,000 lb thrust. The engines are stated to be installed in "twin pods" on the sides of the rear fuselage.

U.S.A.

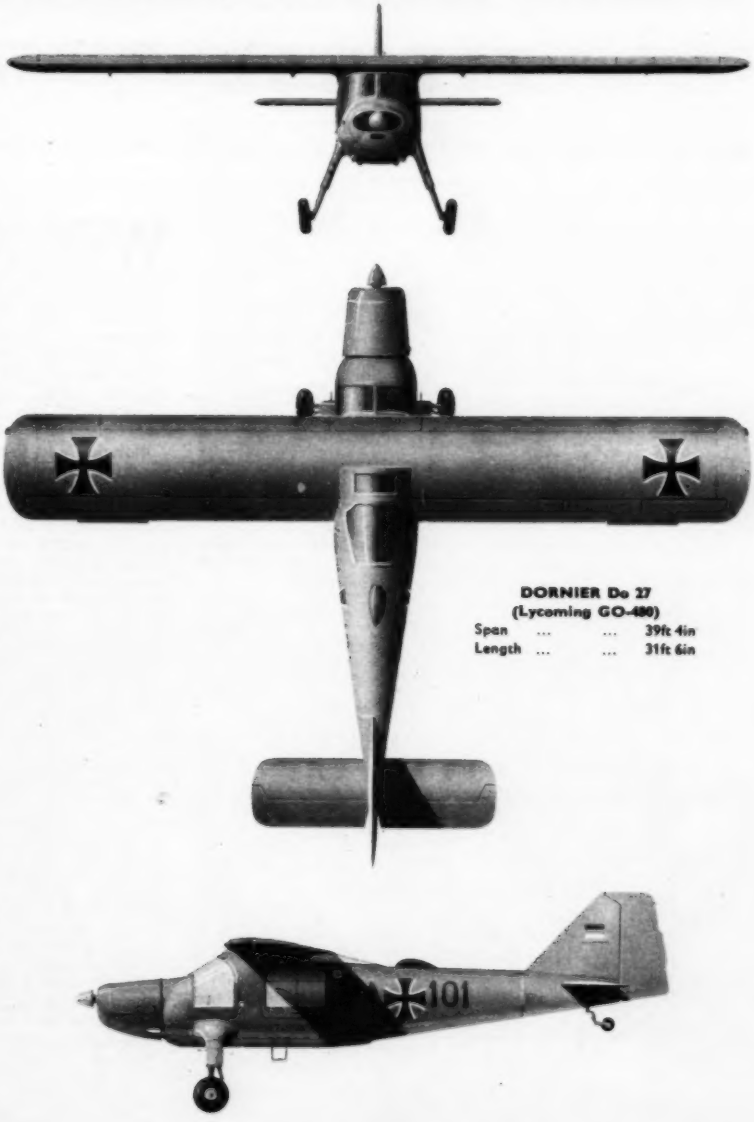
WS-110A. This is the weapon system number of the U.S. Air Force "chemical-fuel" bomber intended to cruise supersonically and have a dash-performance of more than Mach 3. General Electric are reported to have won the contract to develop the powerplant, which will be a very advanced turbojet with afterburner intended to operate at very high speeds and altitudes with extreme peak temperature. Boeing and North American are steadily progressing their competitive work on the airframe and the final aircraft is envisaged as a replacement for the B-52. The engines for this programme are expected to be suitable also for the North American long-range intercepter (WS-202) which may eventually reach a Mach number of 10.

Lockheed F-104. Officially stated to have been delayed from service some six months, Lockheed's supersonic fighter has recently been in considerable trouble. Numerous F-104s have been lost from a variety of causes, and in April a "crash" modification programme by G.E. involved the installation of a dual-ignition system on the J79 engine. This should have ended the run of flame-outs, but the fundamental pitch-up trouble is proving more difficult to cure. It is reported that two small stabilizing fore-planes will be provided, tied to the autopilot in the pitching plane so that incipient pitch-up can be automatically countered by application of full forward stick, over-riding any action which the pilot may take.

Lockheed WV-12. This designation applies to the "flying saucer" Super Constellation radar-picket aircraft. Inside the huge saucer-like radome (carried on a pylon some 10ft above the fuselage) is a 40ft scanner capable of picking up targets at three times the range-limit of the previous WV-2. The scanner is slowly rotated by a Vickers hydraulic motor. Next in the series of Lockheed radar pickets will be a pressurized aircraft with an L.1649 wing and four Allison T56 turboprops.

North American X-15. This advanced research aircraft is being built for the Air Force and Navy in co-operation with the N.A.C.A. Powered by a 20,000-lb-thrust single-chamber rocket motor it will be track-launched and will be controlled by air jets at the tips of the fuselage and wings (since it is designed to fly to heights too great for surface controls to be effective). The first machine, which N.A.A. pilot Scott Crossfield expects to fly next year, is intended for Mach 5 at 250,000ft, but the second and third machines should reach Mach 10 at up to 750,000ft during a typical mission.

Light Turboprop Projects. Both Beech and Cessna have finished the rough project work on light executive aircraft powered by twin Continental T51 turboprops.



DORNIER Do 27
(Lycoming GO-480)

Span	...	39ft 4in
Length	...	31ft 6in

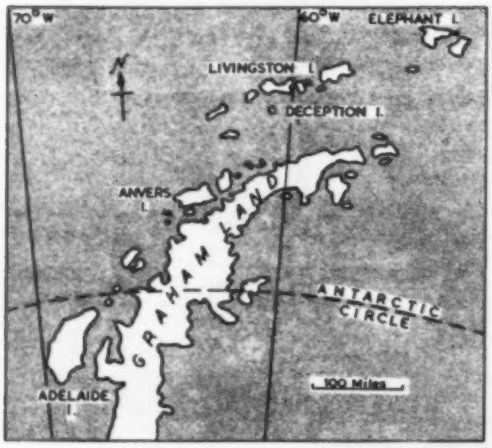
Typical scenery along the coast of Graham Land. (Below) Adult Weddell seal at Deception Island. It was about 8ft long.

FIDASE

PART ONE

THE STORY OF THE FALKLAND ISLAND DEPENDENCIES AERIAL SURVEY EXPEDITION

Deception Island, with coast of Graham Land faintly visible in the background. The horseshoe-shaped island lies about 15 miles south of Livingston Island.



WITH the return to Harwich from the Antarctic on May 13 of the 900-ton depot ship and floating heliport *Oluf Sven*, the work of FIDASE, the Falkland Islands Dependencies Aerial Survey Expedition, was brought to a conclusion.

FIDASE came into being in the spring of 1955 as the result of a contract awarded to Hunting Aerosurveys, Ltd., by the Directorate of Colonial Surveys on behalf of the Falkland Islands Government to carry out an aerial survey for the mapping of some 45,000 square miles of British Antarctica, comprising the South Shetland Islands and the Graham Land Peninsula as far south as parallel 68 deg. To this was added a similar survey of the Falkland Islands themselves, a further 5,000 square miles.

Planning and Preparation. The planners of FIDASE, under the direction of Mr. Peter Mott (expedition leader) and Mr. John Saffery (deputy leader and flying manager), were faced with a number of major problems. A study of weather statistics showed that the best period for aerial survey operations in the Antarctic occurred during the summer months, roughly from November to March inclusive; and they decided that by working against time a start could be made in the summer period 1955-56. The choice of a suitable survey aircraft was a simple problem, because of a restriction imposed by circumstances. No landing strips were available in either the Falkland Islands or Antarctica, but two suitable areas of sheltered water existed, one being the inner harbour at Port Stanley, and the other the remarkable crater-harbour of Deception Island, which was ice-free during the summer months and was centrally placed for operations over the whole Antarctic survey area. The aircraft used, therefore, would have to be flying-boats; but, because no water facilities were readily available along the transit route, amphibians were essential. An additional advantage of amphibians was that they could be beached on their own wheels under their own power, thus avoiding the need for beaching gear and other apparatus.

The type selected as most suitable for the job was the PBY-5A Canso, and two of these were procured from another member of the Hunting Group, the Photographic Survey Corporation of Toronto. Though somewhat slow (120 knots T.A.S.) and of limited operational ceiling (around 14,000ft) the Canso had a good enough radius of action to cope adequately with even the most distant extremities of the area to be surveyed; further, it was an aircraft of rugged construction and proven reliability—important factors in such a remote and desolate region.

Modification of the Canso for the aerial survey rôle did not present any great difficulty. For vertical photography the existing ventral hatch was removed in the air and an Eagle IX camera

The crew of Canso CF-IJJ wearing immersion suits: (left to right) Davis, Green, Brumwell (in hatch), Keen (on steps) and the author.

By Captain Christopher Gavin-Robinson, A.F.C.

THE author of this article has had considerable experience of both Service and commercial aviation. His flying career began with an R.A.F. short-service commission in 1936; later he became a navigation instructor, and in the early war years was engaged on the development of navigation equipment. During the latter part of the war he flew Catalinas, Sunderlands and Liberators in Coastal Command, and from February 1945 until April 1946 commanded No. 240 (Flying Boat) Sqn. After demobilization he flew for a number of commercial operators, including Skyways (Yorks and Lancastrians to the Middle East and India), William Dempster (Tudor 5s to Johannesburg) and Morton Air Services, with whom he was chief pilot. He joined Hunting Air Transport in 1953, transferring to Hunting Aerosurveys in April 1954. He has logged 8,000 hours as a pilot of over 50 types, landplane and flying-boat.

slid over the opening on rails. For oblique photography special ports were cut in the sides of the rear compartment and mountings provided at each to take an F.24 camera. For navigation the nose compartment was fitted with the bomb-aimer's glass window, and a special hatch with a removable watertight cover was provided to allow a prismatic drift-sight to be projected below the hull during flight. Radio compasses and Rebecca were also installed. Each aircraft was equipped with oxygen and efficient heating.

The crew of each Canso consisted of captain, co-pilot, navigator/photographer, camera operator, and flight engineer. Out of the total of ten, the Canadian company provided three, a captain, co-pilot, and flight engineer. The remainder were British.

Whereas operations based on Port Stanley could be provided with all necessities locally, including a radio beacon, marine craft, processing laboratories, maintenance workshops, board and lodging—everything, in fact, except fuel and oil—none of these facilities existed at Deception Island, the base from which the major part of the work had to be carried out. It was therefore necessary to charter a supply ship, and the Danish motor vessel *Oluf Sven* was acquired for this purpose. The list of items carried on the ship was formidable, and included every essential requirement from a half-inch nail to a prefabricated building, from a can of beans to 50,000 gallons of aviation fuel in drums.

In order that the surveyors responsible for the ground control of the survey could have the required mobility it was decided to convey them to and from their triangulation sites by a helicopter operated from the ship. Aircraft and crews for this vital phase of the work were provided by Autair, Ltd., of Croydon, and *Oluf Sven* carried a prefabricated flight deck which could be erected or dismantled as required. For the first season two Sikorsky S-51s were carried, one as reserve; but for the second season these were replaced by a Bell 47D-1. A big difficulty encountered during the first season was the maintenance of the helicopter on deck in severe weather. This was overcome during the second season by fitting *Oluf Sven* with a lift (a miniature of those used on aircraft carriers) by means of which the helicopter could be "struck below" for maintenance and protection from the elements.

Another essential requirement for flying operations based on Deception Island was an aeronautical radio station. This was provided and staffed by International Aeradio, Ltd., and comprised H.F. and V.H.F. two-way equipment, on M/F radio beacon and a Rebecca/Eureka installation. For helicopter operations *Oluf Sven* carried a radio beacon and V.H.F. R/T., also provided and staffed by I.A.L. All radio equipment (including masts and aerials) and the operating staff, under the supervision of Mr. M. R. Milburn of I.A.L., were conveyed to Deception Island in the ship.*

The First Season, 1955-56. *Oluf Sven* sailed from London docks on October 21, 1955, and after calling at Montevideo to bunker and load the expedition's supply of aviation fuel, reached Port Stanley on November 27. There she discharged enough aviation fuel to provide for the survey of the Falkland Islands and

**Though their primary function was to provide aeronautical radio services during the aerial survey of Antarctica, two members of I.A.L., Mr. M. R. Milburn and Mr. J. Moffat, gave valuable assistance as aircrew on the Cansos during the later transit flights to and from Canada and the aerial survey of the Falkland Islands.*

The Cansos ashore at Deception Island. Beyond can be seen the litter of old whalebones along the beach. In the foreground a "melt stream" from the snow of the higher slopes flows past the aircraft.

(Left, above) A Westland S-55 from a passing whale-factory ship, "Southern Harvester," pays a call on the crews of the Cansos engaged in shovelling snow off the slipway. In the background can be seen the netlayer H.M.S. "Protector." (Right, above) Davis and Green moving equipment—the dark-room water pump—during a blizzard. The wreckage of the old whaling base can be seen in the background.

FIDASE . . .

left two mooring buoys for the use of the Cansos. She then sailed for Deception Island, which she reached on December 4.

The moment the ship dropped anchor in Whalers Bay, just inside the narrow entrance to the great crater-harbour of Deception Island, was a significant one in the history of FIDASE. From then on the expedition ceased to be an anxious and often chaotic period of equipping, provisioning and travelling, and instead became an adventure and a challenge. The exhilaration of this change did not affect the crews of the Cansos until five weeks more had elapsed; then, on January 10, 1956, after a 600-mile flight southward from Port Stanley, we saw the brilliant sunlight from a sky of the clearest imaginable blue catch the white snow-peaks of Livingston Island fifty miles ahead. It had been a long and arduous transit flight from Toronto down through the Caribbean and Brazil, with frustrating setbacks at Montevideo and Port Stanley caused by adverse weather; but here at last was Antarctica, the land we had come 8,000 miles to survey.

As we approached Livingston Island the scenery, so typical of what we were to see during the months ahead, revealed itself in more and more detail: the dazzling snow slopes; the black rock pinnacles and precipices; the glaciers, crevasses and ice-cliffs; the royal blue sea, relieved by the white mosaic of sea-ice and the pale blue-green tints of great icebergs floating alone miles from shore.

A few minutes' flying beyond Livingston Island and we came to Deception. The name Deception was given to the island by the sailors who first saw it, for they believed it to be just another large, snow-capped island until they found the narrow gap in the black cliffs which revealed the harbour inside. Deception is, in fact, no more than a horseshoe of volcanic rock, rising in places to over 1,000ft above sea level. From the air it looks like what it is: the ancient crater of a huge submerged volcano into which the sea has poured through a gap probably caused by some titanic explosion when the world was young. Although the upper slopes and summits were covered in snow, we could see large expanses of naked black beach and cliff which appeared to indicate that some latent warmth still remained from the forgotten inferno.

Submerged though it may be, sufficient of the crater rim projects above the sea to give a pilot the impression of letting down into an immense black and white bowl when he comes in to land. The water area is actually much larger than it appears, and in Port Foster, the main part of the harbour, one can put down in any direction with plenty of room to spare, the distance coast to coast being nowhere less than four miles. With experience, however, we found we could take off and alight safely in the much smaller area of Whalers Bay.

Arriving for the first time we took no chances and picked the longest possible run in Port Foster, which meant we had to taxi two or three miles to the base in Whalers Bay. Rounding the point which forms the western arm of the bay we saw *Oluf Sven* anchored close inshore, backed by the disused oil storage tanks and widespread wreckage of an old Norwegian whaling factory. To the left were the masts of the new radio station; and to the right, well clear of the ship, were our two mooring buoys. The curving black beach of the bay swept round in a crescent to the right, where it became the foot of a line of vertical cliffs three hundred feet high which terminated abruptly at the entrance to the harbour.

After mooring up we were taken ashore in the safety boat, ex-R.A.F. seaplane tender 956 (brought out by *Oluf Sven*), to join the other members of the expedition whom we had not seen since leaving England for Canada in September. FIDASE was at last complete.

On the high ground behind the old whaling factory stands "Biscoe House." One of the original huts built by the Norwegians, it is occupied throughout the year by the local staff of the Falkland Islands Dependencies Survey, a team of young men whose duty it is to keep meteorological records and observe other scientific phenomena. A number of similar outposts exist throughout British Antarctica. They are known as "bases," Deception Island being Base B. The base leader is a man of importance, his duties including those of magistrate and postmaster. Those members of FIDASE living ashore, among whom were the Canso crews, slept in the large attic of Biscoe House, a somewhat draughty roost, and our first act after getting ashore was to erect our camp beds there and settle in as comfortably as could be contrived.

In the five weeks since their arrival at Deception the ship's party had been anything but idle. In addition to countless minor jobs, they had accomplished four main tasks, namely, the construction of the prefabricated building which contained the photographic laboratory, the kitchen, the dining-room, and the power house for the two diesel generators; the unloading and storing on the beach of 40,000 gallons of aviation fuel in drums; the unloading and erection of the wireless station and radio beacon,

"Oluf Sven" at sea with the Bell 47D-1. (Right) The Bell comes in for a landing on the deck of the ship.

The author's Canso flying off the Trinity coast on return from a photographic sortie.

both of which had already been of great value to us on the flight from Port Stanley; and the siting and laying of the two mooring buoys, a difficult feat in water which deepened so rapidly from the shore.

By the time the Cansos arrived the base was fully operational, but unfortunately the good weather which had blessed our flight from Port Stanley did not hold. Next day, and for many days thereafter, strong winds, clouds, sleet and snow swept across the area. Polar clothing was the unanimous fashion, and the new arrivals got a good acclimatization to Antarctic conditions. The spell on the ground, however, was not wasted. It was the turn of the aircrew to do their share in building the base, and we set to work to convert several tons of P.S.P. (perforated steel plate matting, brought by the ship) into a slipway up which the Cansos could be taxied for maintenance and refuelling. Though the slope of the beach was gentle, the surface of black volcanic ash was too soft to support an aircraft as heavy as the Canso; but the P.S.P. laid on top was ideal for the job and withstood two seasons' use without repair. The slipway was used more and more as time went on, and eventually the Cansos were invariably parked on the beach unless weather conditions made it impossible to come up. One operation greatly simplified by beaching the aircraft was refuelling. This was a problem at moorings, the only feasible method being to pump the fuel from the beach through a buoyed hose—a tedious process which resulted on one occasion in the refuelling pump attached to the shoreward end of the hose being inadvertently towed down the slipway into four feet of water.

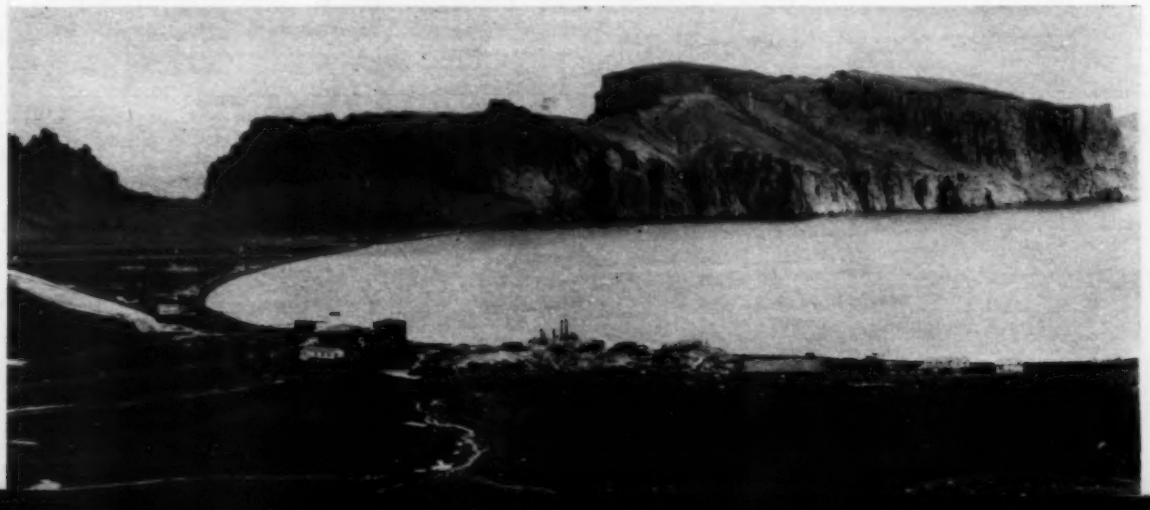
In addition to its other benefits, the slipway made possible the unique and pleasant experience of being able to load the aircraft and run up the engines ashore and then to taxi into the sea for take-off. Thus the convenience of the landplane was combined with the ability of the flying-boat to take off into wind unrestricted by the narrow limits of a runway. After flying, the reverse procedure applied.

The first actual survey photographs to be taken by the expedition were of Low Island, situated about 50 miles south-west of Deception. The view from 14,000ft, seen by us for the first time, was unforgettable. Generally speaking, when the Antarctic weather decides to be good it is superb. The sky is a deep blue at the zenith, paling gradually to a slight suggestion of haze at the horizon. The air is so clear that the snow-covered, mountainous islands typical of the area stand up in sharp outline and detail from the ice-dotted azure of the sea. In the brilliant sunshine everything sparkles with newness as though it had just been created, instead of showing the mark of the countless centuries which have passed since the first snow fell. We became accustomed to this scene as the months passed, but the thrill of that first morning over Low Island never quite failed to renew itself every time we climbed from the sombre bowl of Deception Island into the blue and white world outside.

(To be concluded)

(Below) After the longest photographic sortie of the expedition, 10 hr 40 min, on Boxing Day 1956. Brumwell, Green, Gavin-Robinson and Davis carry magazines to the photographic laboratory.

Whalers Bay, showing wreckage of old whaling factory with the hut erected by the expedition next to the oil storage tanks.



LONDON SEA

At the Half-way Mark of 195

ONSEASON

...f 1957 London Airport Prepares for the Peak of Another Record Year

THE terminal buildings of London Airport Central (photographed from the air a few days ago by B.E.A.'s chief photographer, H. B. Stewart), have already handled about 15 per cent more traffic than they did in the first half of last year. Now L.A.P.'s staff—whom aircrews and seasoned travellers regard as second-to-none—prepare for a busier-than-ever summer. More than three and a half million passengers should pass through these buildings, and those of London Airport North (not shown), during 1957. The small pictures show (top) embarkation lounge and control tower; (bottom) main entrance and concourse.

HELICOPTER ENTERPRISE

Progressive Development by Canadian Survey Firm

CANADA'S largest operator of helicopters, Spartan Air Services, has recently taken a significant step forward by building a new helicopter overhaul and repair plant and helicopter school at Uplands Airport, Ottawa. This facility, costing $250,000, was officially opened recently by the Canadian Minister of Transport, Mr. George Marler.

Located near the new terminal building now under construction at Uplands—with an eye to providing possible future passenger services by helicopter—the new plant is at present busy on maintenance work for Service and commercial operators as well as on the company's own helicopters, which total 22. Training for both pilots and engineers is provided in the instructional school which forms a section of the plant. The new facility is backed up by the firm's fixed-wing maintenance plant at the same airport, equipped for radio, sheet-metal, carpentry, plastics and other shop work.

Spartan's rapidly expanding helicopter division is today an important segment of the company's air survey fleet, which comprises no fewer than 47 aircraft. The most recently acquired of these is a Cessna 310 (photograph below).

The company was formed in 1946 by two ex-R.C.A.F. aircrew, John A. Roberts and Russell L. Hall, with two aircraft. Expansion of the company followed Canada's increasing need for a variety of air-survey projects, including forestry mapping and irrigation projects, involving both high-altitude and low-altitude photography.

In 1950 Canadian Aero Service, Ltd., was formed, as a joint subsidiary of Spartan Air Services and Aero Service Corporation of Philadelphia, and the two Canadian companies entered the field of geophysical survey work, using the Gulf magnetometer. It was in this year that Spartan bought its first Bell helicopter, in order to fulfil a Government contract for a topographical survey.

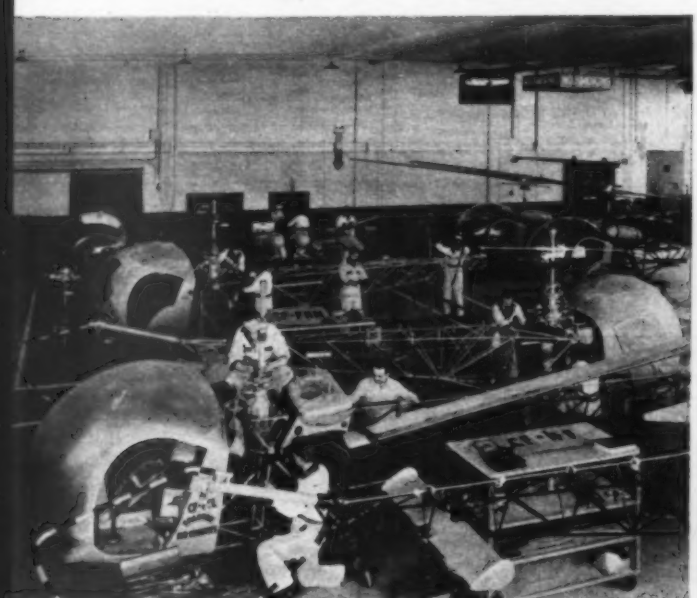
Five years later, electromagnetometer techniques were introduced with the company's fixed-wing machines, and helicopter operations showed an enormous expansion. It had been demonstrated that mining and oil firms could reduce travelling time to and from ground survey sites by 60 per cent with the use of helicopters.

At present, some 60 per cent of Spartan's helicopter activity is carried out for private companies and the remainder for the Government. The helicopter fleet has increased to 22 machines out of the company total of 47, and last year they flew 46,000 miles on topographical survey work in northern Canada; operated an airlift in connection with the Mid-Canada radar chain; and carried mining and oil crews in locations from coast to coast.

In general, Spartan's work has reflected the expansion of Canada herself; projects have included air surveys for the St. Lawrence seaway and power programme, and for the construction of railway lines to Lakes Lynn and Moak; detail mapping for the new trans-Canada microwave relay system and for many growing towns and cities; and mineral surveys for major mining and oil companies.

In addition to operations in Canada, the company's fixed-wing aircraft and helicopters have for several years been employed on overseas air surveys, in countries such as British Guiana, British Honduras, Columbia, India, the Philippines, the U.S.A. and England (the Canadian Aero Service geophysical survey of the Midlands was described in *Flight* for November 4, 1955). This year's projects include a $385,000 Colombo Plan contract for air mineral survey in Malaya; a million-dollar Canadian government contract for high-level photography of the Arctic and a 19,000-square-mile high-altitude photography project in Africa. Among the company's natural-resources survey staff are specialists in agriculture, soils, timber, oils and minerals.

Divisional manager of Spartan's helicopter division is Mr. J. G. Townsend, and the total number of personnel in the division is 73, of whom 27 are pilots. Helicopter pilot training has been carried out by Spartan for several years; basic, advanced and conversion courses are at present offered. The other training activity at the new plant at Uplands is that for maintenance engineers, who undergo a six-week conversion course of theoretical and practical instruction on major overhaul and field maintenance.



(Left) Part of Spartan Air Services' new helicopter shop, with Bell 47s in various stages of overhaul. (Below) Mr. Trevor Acfield (left) sales manager, Sanderson Aircraft, Toronto, turns over the keys of a new Cessna 310 to Mr. W. W. Phipps (right) manager of Spartan's research and engineering division. This aircraft, modified for a special camera installation, is the most recent addition to Spartan's fleet.

STUDENTS' PERENNIAL PROBLEMS: 2

By ALAN H. YATES, B.Sc., B.Sc.(Eng.), A.F.R.Ae.S.

ACCURACY AND COMMONSENSE

THE need for arithmetical accuracy is so instilled into us as children that many students find it difficult to accept approximate methods of solving problems. One result is that much time is wasted in lengthy, over-accurate methods; but more serious is the lack of a sense of proportion sometimes revealed. Let me give an example.

Flight observers in training will often measure airspeed by an indicator which is accurate only to the nearest knot, and after applying various complicated corrections, will give an answer as, say, 251.38 kt. This fault—giving too many significant figures—is not confined to students. The records ratified by the F.A.I. are often quoted to an unjustified accuracy. Several height records are given to the nearest 1/100th of an inch! Whatever the method of measuring height, it is clearly unnecessary to quote the height at which an aeroplane is flying to an accuracy closer than, say, ten feet. If we are told that an aeroplane has reached 18,079.534ft, we are entitled to ask which part of the aeroplane reached this height.

The world distance records are recorded to the nearest yard! It is almost impossible to measure a take-off run to this accuracy, and to quote the length of a flight to the other side of the world to a yard is quite unnecessary.

These examples are not serious, but there have been many worse. During the late war I was asked to measure the effect of a new radar dome on the level speed of a bomber. A rapid calculation by an approximate method suggested that the drop in level speed would be about 2 kt only, and experience had shown that a very large number of flights would be needed to establish the drop to within 1 kt. I suggested that brief tests would not give a useful answer and that prolonged tests would not be worth while. Nevertheless, many hours were flown to obtain answers which should have been written as, say, "3±3 kt". A waste of time and money, because the limits of testing accuracy were not appreciated.

Plotting Experimental Results. This failure to assess the accuracy of measurement is often revealed when experimental results are plotted. If values of some quantity, y, are measured for a range of values of another variable, x, we are faced with the problem of drawing a curve through a series of points, as in Fig. 1:—

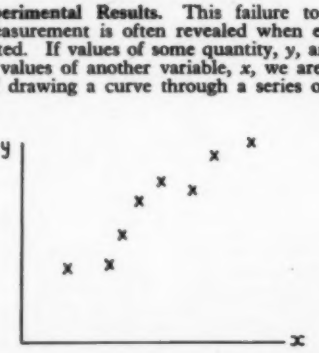


Fig. 1

What kind of curve should be drawn? It may be that experimental error does not arise—for example, if y is the number of aircraft movements recorded in successive months of the year. The curve must thus pass through each point. Doubts often arise because the observer fails to realize that each cross is merely the centre of an area. He should constantly have in mind the accuracy of his measurement. If, for example, y is the reading of airspeed and x is the engine thrust, then there is an accuracy to be associated with each reading, such as ±1 kt in speed and ±10 lb in thrust. If these are indicated, we have:—

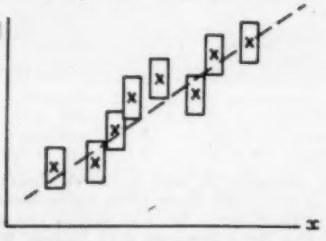


Fig. 2

and there is little to be said for drawing anything more elaborate than a straight line.

If, however, y is a hospital patient's temperature and the nurse and thermometer are up to standard, then the possible errors may be negligible and we would be entitled to draw:—

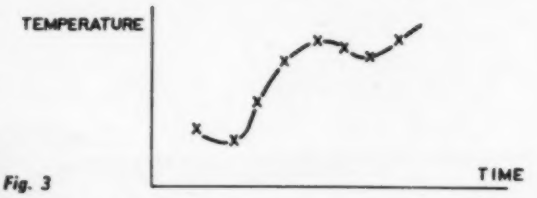


Fig. 3

Such a curve implies that the observer considers that intermediate readings, had they been taken, would have fallen on the curve drawn.

It is, of course, a great help to know what the answer should be. It is known that the body temperature of a sick man may vary rapidly, and Fig. 3 is not unreasonable. The observer who draws Fig. 3 as the relation between airspeed and thrust is the sort of man who will quote height records to one-hundredth of an inch!

In short: to every experimental measurement must be assigned an assessment of accuracy.

Quick but Approximate Methods. It is often a great asset to be able to give a rough estimate quickly. In the example quoted above, a rough estimate of the speed drop of an aeroplane when a radome was added was required. Necessary rough data required were:—

Drag of aeroplane (at 100ft/sec) about 400 lb.
Drag of radome (at 100ft/sec) about 8 lb.
(say, 4 sq ft frontal area at 2 lb/sq ft)
i.e., *Drag Increase 2 per cent.*
Cruising speed of aeroplane 300 kt.
∴ Drop in speed = 2/3 per cent = 2 kt approx.

This last step assumes that speed varies inversely as the cube root of the drag coefficient which was approximately true for that type of aeroplane.

Oddly enough, the most difficult idea for many students to follow has been found to be this: "If speed³ varies inversely as drag, then 1 per cent decrease in speed results from a 3 per cent increase in drag."

I have had to expand $(1+x)^3$ and to show students that, if x is small, then $(1+x)^3$ is approximately $1+3x$, so that a small increase x in speed corresponds to an increase of $3x$ in drag. Many are unconvinced and suspicious of the approximation; but if the rough result is 2 kt and the accuracy is ± 1 kt, then nothing more elaborate is needed.

I am sure that a knowledge of such short cuts is of more value to the student than the ability, so beloved of examiners, to evaluate the square root of a number by the long-division method!

BUSINESS-FLYING TRENDS

ACCORDING to a recent survey, there are now 23,000 business aircraft in the U.S.A., flying some 4,600,000 hours per year. It is expected that, by 1976, business flying will account for 11,000,000 of the 20,000,000 hours forecast for all U.S. civil operators during that year. General trends are towards an increase in the number of light twins and multi-engined business transports, substantially fewer two-seaters and a slight increase in high-performance single-engined aircraft.

By reason of high costs, only a small number of turbojet executive aircraft are expected to be used during the next 20 years. According to the survey, piston engines will remain as the principal powerplants for the time being, increasing powers and superchargers becoming more common, together with pressurization as ceilings increase. Turboprops will soon begin to replace piston engines, both in single- and twin-engined aircraft. Single-engined speeds will range from 125 m.p.h. to 250 m.p.h. and the speeds of light twins will vary between 350 m.p.h. with turboprops and 250 m.p.h. with piston engines. Single- and two-seat aircraft will be produced mainly for training and sporting flying where low first cost and economy are important.

SLOW ROLL

A classic aerobatic manœuvre is demonstrated here by North American chief production pilot George Matteson in an F-100D Super Sabre fighter/bomber. The sequence of pictures, one of which certainly merits the large reproduction above, was secured from the tail gun position of a North American B-45 Tornado jet bomber.

CORRESPONDENCE

The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns; the names and addresses of the writers, not for publication in detail, must in all cases accompany letters.

Up-to-date G.C.A.

YOUR correspondent Mr. J. M. Wilde ("Up-to-date G.C.A.," May 31) may have been writing about an MPN 4 or 11C equipment, made by Gilfillan as stated in his letter (which contains a few errors—quite naturally, I hasten to add, as Mr. Wilde spent such a short time inspecting the equipment).

What I would like to correct is part of his last paragraph, "integration of the search and precision elements might have the effect of slowing down the landing rate." Far from it, it can only speed it up; let me explain.

The new equipment has three operational bays with search and precision, the centre one being normally used for search directions as it has a 40-mile maximum at 8,000ft, tilting the aerial for higher-altitude pick-ups; it also has a 200-mile range for I.F.F. pick-ups only. This allows the centre-bay controller, under heavy traffic conditions, to work director only, and the two outer bays to work precision at the same time at about four-mile intervals—i.e., first aircraft touching down, second at four miles, third at eight miles. (I have achieved a four-mile landing rate on the Decca 424 with two search scopes and two controllers so you do not necessarily need very expensive equipment to do it—see *Flight*, October 8, 1954.) This landing rate can be speeded up for military traffic, but, as you can imagine, continuity is the difficulty.

The cost of the new MPN.11C in dollars, as compared with the present MPN 1 used at civil airports, would not justify its employment, except (in my opinion) at London Airport, where the higher altitude search and speeding up of landings under G.C.A. weather may make it worth while.

After 12 varied years of controlling aircraft, the last eight almost exclusively on radar, I am firmly convinced that the only form of control that should be used in this country of congested airways is radar, with I.F.F. and heightfinders combined, and with all major airport traffic under compulsory I.M.C. control. Happily the Ministry of Transport and Civil Aviation have already gone a long way towards reaching this goal under the present air-traffic control system—but not enough money and equipment, or staff, seems to be coming along into the present system's expansion programme.

Ramsden, Oxford. DENNIS COOPER.

"State of the Jet Art"

MAY I make some comments on your note "State of the Jet Art" on page 192 of your issue of February 8? As an inspection of the general form of the range equation

$$R = \frac{v}{s.f.c.} \frac{L}{D} \log_e \frac{W}{W_2}$$

reveals, range is independent of the size of the aeroplane.

Weight ratios, however, do have influence on the range. The total load mainly consists of fuel plus payload and is a nearly constant fraction of the gross weight. Hence it follows that the ratio of the weights becomes large if the useful load is kept small; then the fuel-load ratio is large—and so is the range.

Therefore I see no reason why the range or stage length should have such a pronounced increase with the gross weight if the payload ratio is held constant, as, for example, 10 per cent in the graph you reproduced from *The Engineer*, January 11 issue. What appears there to be a correlation seems to me a pure and misleading casualty. The variation of the stage length may be due to different L/D ratios (or aspect ratios), engine characteristics (s.f.c. and thrust) and finally, design cruising speeds (see above formula).

When comparing range performance, conditions must be set up, whether certain items should be held constant for all aeroplanes, while others may vary, or *vice versa*. For example: constant wing loading, t.o. run, cruising altitude and variable L/D, speed and size, etc.

Dallas, U.S.A. KARL L. SANDERS.

Flying-boat Docks

IT was with interest that I noted your photograph of the R.A.F. floating dock in *Flight* for April 5. I served in the unit to which this dock was attached. She was built at Sheerness dockyard and handed over to the M.A.E.E., Isle of Grain, in about 1922, and was used for docking and refuelling the old "F" boats. She had tanks holding over 3,000 gal of aviation spirit, up-to-date workshops and living accommodation for officers and men (approx. 14 persons). She was fitted with a universal cradle which could take the various chocks to fit different types of flying boats.

On our move to Felixtowe the dock took aboard the Fairey Atalanta, which was then the world's largest flying-boat. She (the dock) remained at Felixtowe for many years, but the fitting of beaching wheels to flying-boats made her of little use except for docking marine craft. She later went to Pembroke Dock, where I believe she was eventually scrapped. You may be interested in the enclosed snap [unfortunately unsuitable for publication—Ed.] of a smaller dock which we first used at the 1929 Schneider Trophy race at Calshot for docking the three Italian seaplanes. The photograph shows this dock at Basra, Iraq, in 1930, with Marine Section No. 203 F.B. Squadron and an all-metal Southampton.

North Harrow, Middx. A. S. HARDWICK
(ex F/Sgt. A.S.R. and M.S., R.A.F.)

R.F.C. and R.N.A.S. Memories

I READ A.L.E.'s letter in your issue of January 4 with interest. Your correspondent, however, is a little off the beam in two of his statements. In March 1917 there were only three squadrons at Verte Galland Farm, namely, No. 56, S.E.5s; No. 19, Spads; and my own squadron, No. 66, Sopwith Pups. Later in the year we all went to Estre Blanche, where 70 Sqn., equipped with Camels, joined us.

The statement that 66 Sqn. went to Hornchurch in July 1917 for two weeks during the Gotha scare is also wrong. We went to Calais; the only squadron which went to England was No. 56, and they were stationed at Bekesbourne, near Canterbury. On the only operation during that fortnight, I landed near them after having run out of petrol.

I would like to add that in 1916 No. 70 Sqn. with their 1½-Strutter Sopwiths did a magnificent job, as their terrible casualty list proved.

Melbourne, Australia. G. ROUND.

I WAS interested in your article "The Sopwith Triplane," by J. M. Bruce, M.A. (April 19 and 26). On page 556 it is stated "It is recorded in *The War in the Air* that the original Sopwith Pup and Triplane survived the war. As far as the Triplane is concerned, that statement is incorrect, for N.500 was written off at Dunkerque after fair wear and tear, on December 17, 1917." It may be of interest to you to know that I was at Petit-Sans in France with No. 6 Naval Squadron and at that time we were using D.H.9s. There was a squadron of Triplanes in operation in January and February of the year 1918. We also had a squadron of D.H.4s.

In Mr. Bruce's article I cannot find any reference to Triplanes at Petit-Sans. (I am not absolutely sure of the spelling of the place, but it is in the Dunkerque area.)

Kingswood, Surrey. F. S. SAUNDERS
(ex-R.N.A.S.).

IN BRIEF

Mr. Charles W. Benson, of 196-49 45th Road, Flushing 58, New York, N.Y., is endeavouring to obtain 8 mm or 16 mm films of the Mignet H.M.16 and H.M.18 *Pou-du-Ciel*, or "Flying Flea."

FORTHCOMING EVENTS

June 9-16. Western France Aero Club: Angers Gliding Week, Angers.
June 15. Northampton Gliding Club: Open Day, Sywell.
June 15-16. Lower Normandy Aero Club: 10th International Rally, Flers.
June 15-17. Le Zoute Aviation Club: Invitation Rally.
June 17-20. I.A.S.: National Summer Meeting, Los Angeles.
June 17-29. Institute of Welding: British Commonwealth Welding Conference, London and Saltburn-by-the-Sea.
June 19. Kronfeld Club: Film Show.
June 21-24. Palermo Aero Club: 9th International Aerial Tour of Sicily, Palermo.
June 23. Northern Heights Model Aero Club: Gala, R.A.F. Halton.
June 24. F.A.I. Annual Conference, Palermo.
June 26. Kronfeld Club: "The R.A.F. Formation Squadron," by S/L. Topp.
June 27-July 1 British Institution of Radio Engineers: "Electronics in Automation" Convention, Cambridge.
June 29-30. Invitation Rally, La Baule.
July 5. Tiger Club: Aerobatic Contest, Sywell.
July 5-8. Swiss Aero Club: International Rally, Bienne.
July 6-7. Aéro-Club de l'Ouest: International Rally, Angers.
July 6-8. Invitation Rally, Deauville.
July 9-14. Pescara Aero Club: International Air Week.
July 10. Kronfeld Club: Film Show.
July 12-13. Royal Aero Club: National Air Races, King's Cup, and Lockheed Aerobatic Trophy, Baginton.
July 14. Wolverhampton Aero Club: Invitation Rally.
July 14. Yorkshire Aeroplane Club: At Home, Sherburn-in-Elmet.
July 27-Aug. 5. National Gliding Championships, Lasham.
Sept. 2-8. S.B.A.C. Show, Farnborough.

G-AKGH R.M.A. "Caledonia," B.O.A.C.'s first B-377, seen in its original Corporation livery. It was delivered to B.O.A.C. in October 1949.

Eight Years of Trans-oceanic Service and Passenger Comfort

By DENNIS M. POWELL

The Stratocruisers Carry On

THE widely advertised policy of both B.O.A.C. and P.A.A. in continuing to employ their Stratocruiser fleets on first-class and "super luxury" flights across the Atlantic (and, in the case of P.A.A., the Pacific as well) has caused a certain amount of eyebrow-raising by people in the airline business—more especially those other major I.A.T.A. carriers whose own top-flight equipment for the world's most competitive over-ocean routes includes the DC-7 and Super-Constellation series.

But to those of us with an affection for the Boeing B-377 the policy of the two airlines comes as no particular surprise. Despite the obviously more economic merits of the faster and relatively larger payloads carried by 6Bs, 7Cs and Super-Connies (and probably by 749As, too), the "old" Stratocruiser continues to more than hold its own on both the North Atlantic and Pacific schedules. I believe it will continue to do so until the early 1960s, when the Britannia 300 series, Boeing 707 and (later) the DC-8 duly take over the cream of the traffic on these routes. Looking even further ahead, I think the B-377 may possibly continue its useful life by being employed on the newly (I.A.T.A.) proposed "Coach-*cum*-third-class" services over the North Atlantic; and in the U.S.A. (and possibly elsewhere) it may continue to be employed, perhaps as a cargo carrier, until the time comes for the type to be withdrawn from active airline operations. This may not be before 1965.

Many *Flight* readers will recall previously published articles and news items on the B-377's technical background and the continuous development of the type since July 1947, when the original *civil* prototype (NX.90700) first flew from Boeing's Seattle plant. (The writer particularly recalls the fine series entitled "Collecting a Stratocruiser for B.O.A.C." by *Flight's* Editor, published in the issues of December 1, 8 and 15, 1949.) The object of the present article is to put on record some of the less well known facts about the Stratocruiser's career.

Of the 55 B-377s originally ordered by P.A.A., American Overseas Airlines, B.O.A.C., S.A.S., Northwest and United Airlines—all of which were built and delivered between January 1949 and March 1950—a total of 50 are still very much in active service with P.A.A., B.O.A.C. and Northwest. Recent figures for the individual B-377 fleets of these airlines are 25, 16 and nine respectively.

From April 1, 1949, to April 1, 1956, P.A.A.'s combined fleet of 377s (progressively increased to a final total of 29* as each was delivered) flew the huge total of some 818,000 hours, logging 205,328,000 miles. During this seven-year period they carried just over four million passengers on 18,400 Atlantic flights and 15,500 crossings of the Pacific. P.A.A.'s first scheduled B-377 Pacific flight (San Francisco - Honolulu) was on April 1, 1949, and their first Atlantic (New York - London) crossing on June 1, 1949. Proving and demonstration flights took place several weeks before these dates, and, for the record, the first civil B-377 to appear in the United Kingdom was P.A.A.'s N1028V *Clipper Flying Cloud*, which visited London Airport on April 8, 1949 (when the number of journalists, travel agents and other guests carried on demonstration flights earned the aircraft the nickname *Clipper Flying Crowd*).

At least six of P.A.A.'s Boeings have logged 20,000-plus hours apiece; these include N1023V, N1025V, N1028V and N1031V. Other units of P.A.A.'s Boeing fleet have each logged 15,000-plus hours, whilst the eight additional 377s which the company acquired as a result of the amalgamation of American Overseas Airlines with P.A.A. in 1950 have each logged an average of more than 10,000 hours apiece. These ex-A.O.A. 377s are registered N90941 to N90948 inclusive—although it must be recorded that one of them is no longer with us. This was N90943, *Clipper Sovereign of the Skies* which made a dramatic and highly successful ditching between Honolulu and San Francisco on October 16 last year. Thanks to the superb airmanship of Capt. Dick Ogg and his crew,

**This figure includes A.O.A.'s fleet, acquired in 1951.*

Pan American's first B-377, delivered in February 1949, was originally named "Clipper America" and later renamed "Clipper Golden Gate."

(Left) An unusual wheels-down impression of United Airlines' N31225, their first Stratocruiser; it later became B.O.A.C.'s G-ANTX "Cleopatra."

(Below) The original civil B-377 prototype NX90700, which first flew as long ago as July 1947

(Bottom) Northwest's Stratocruisers —this one, N74601, was delivered in November 1949—have square windows.

THE STRATOCRUISERS CARRY ON . . .

all 25 passengers and eight crew aboard escaped with only minor shock and a ducking. All were picked up (in less than 15 minutes) by lifeboats from the U.S. weather-ship near which Capt. Ogg had arranged to ditch.

P.A.A., in close co-operation with Boeing, Pratt and Whitney, and the (American) G.E.C., decided late in 1953 to modify ten 377s in order to improve their payload, speed and range for North Atlantic operations. At a total cost of over one million dollars these ten aircraft were re-worked during the autumn of the following year at P.A.A.'s huge Miami engineering base, returning to the North Atlantic schedules early in 1955. Under the name "Super Strato-Clippers," they have since proved themselves highly successful in operating P.A.A.'s "one-stop" westbound first-class Atlantic schedules. The same 377s often operate eastbound flights *non-stop* New York - London or New York - Paris when payloads and weather conditions permit. Over the North Atlantic "on peak" season—April-September—P.A.A. are currently operating eleven B-377 flights weekly between England and America on their much-publicized "President" and "President-Special" first-class flights.

To turn now to B.O.A.C., it can be recorded that the Corporation's original fleet of ten 377s have a very fine record of operating achievement. From December 5, 1949, to December 5, 1954, they logged a grand total of 102,000 hours, covering 6,242 Atlantic crossings, with a total mileage of approximately 32,640,000. From September 1954 B.O.A.C. augmented its 377 fleet by the purchase of seven additional Stratocruisers—six from United Airlines and one from Pan American. Although these seven additional Boeings were all delivered to the Corporation by March 31, 1955, I understand they did not go into scheduled service on B.O.A.C.'s North Atlantic routes until June 1955. Each Boeing was required to undergo "essential modification" to bring them up to the Corporation's own operational standards. This also included re-fitting each aircraft to the 81-seater tourist layout.

In 1955-56 all of the Corporation's important dollar-earning North Atlantic schedules were operated entirely by 377s: eight of these aircraft carried 81 tourist passengers apiece on the "Coronet" flights between the U.K. and North America, while the other eight operated the luxury first-class "Monarch" flights (50 passengers) on the same route. Up to December 5, 1956 (seven years of continuous operation), B.O.A.C.'s Stratocruisers logged a grand total of around 190,000 airframe hours with a total mileage of 60,800,000.

Despite the recent introduction of the DC-7 "Seven Seas," the Corporation intends to continue to operate its "Monarch" flights with Stratocruisers. They will now carry a maximum of only 40 passengers, all in "slumberette"-type seats, whilst the DC-7Cs will be used to operate mixed-class (first and tourist) transatlantic flights. A small number of the Boeings will, in addition, operate first-class-only flights between the U.K. and West Africa, replacing Canadair 4s on the latter route. I understand that all the Corporation's Boeings are being progressively re-fitted to enable them to be employed in accordance with these plans for both this year and 1958.

Reverting to P.A.A.'s Super-Stratocruisers on their crack "President" and "President-Special" Atlantic flights, it is interesting to observe that they each carry a maximum of 39 passengers in "sleeperette"-type seats; and in addition they can accommodate 13 in sleeper-berths plus *four* additional passengers in two "President staterooms," the last-named "super luxury" bearing an I.A.T.A. surcharge of £44 13s for "double occupancy," or £89 6s for "exclusive use of one passenger." It only goes to prove that there are always people willing to pay a good deal of money for "privacy"—even if only for a few hours in mid-air over the Atlantic.

All Northwest Airlines' fleet of nine Boeings are currently employed on U.S. domestic schedules. Between 1950 and 1954, however, a number of them were used by N.W.A. on its highly lucrative first-class Pacific services—Seattle to Manila *via* Anchorage and Tokyo. Early in 1955 the company took delivery of five Super-Connies (1049Gs), which replaced the 377s on this route. At least three of N.W.A.'s Boeings have logged 20,000-plus hours apiece, whilst the daily utilization of this type in 1955 was an average of 8¾ hours per aircraft. Incidentally, I believe this beats both P.A.A. and B.O.A.C.'s highest-utilization figures for the B-377.

Although the Stratocruiser may not have the graceful lines of the Constellation or the general good looks of the DC-6/DC-7 series, I usually protest strongly when I hear the assertion that the "old Boeing" is an ugly aeroplane "with a deep blunt nose like the face of some prehistoric monster." It may not be a good-looking aeroplane in the accepted sense of the term, but (and what is far more important to the airlines which still continue to operate the type on their most competitive routes) it is still doing a very fine job of work. And even if Stratocruisers are not altogether popular with the engineering staffs who have to maintain and service them the British and American crews who fly them seem well content; and the same could probably be said of the 5,000,000-odd passengers who have sampled the Stratocruiser's safety, comfort and "double-bubble" spaciousness—with the unique lower-deck cocktail bar reached by the spiral stairway.

CURRENT STRATOCRUISER FLEETS

P.A.A. (total, 25): N1022V to N1026V, N1028V to N1031V, N1033V to N1038V, N1040V to N1042V, all inclusive, N90941/42/44/45/46/47/48 (ex-A.O.A. fleet taken over by P.A.A. in 1951). Note.—N1022V was originally NX90700, the prototype civil Stratocruiser.

B.O.A.C. (total, 16): G-AKGH R.M.A. *Caledonia*, G-AKGI *Caribou*, G-AKGJ *Cambria*, G-AKGK *Canopus*, G-AKGL *Cabot*, G-AKGM *Castor*, G-ALSB *Champion*, G-ALSC *Centaurus*, G-ALSD *Cassiopeia*, G-ANTX *Cleopatra* (ex-U.A.L. N31225), G-ANTY *Coriolanus* (N31226), G-ANTZ *Cordelia* (N31227), G-ANUA *Cameronian* (N31228), G-ANUB *Calypso* (N31229), G-ANUC *Clio* (N31231), G-ANUM *Clyde* (ex-P.A.A. N1027V).

Northwest Airlines (total, 9): N74601/02/03/04/05/06/07 and N74609/10.

The Queen inspects Venoms of No. 151 Sqn. during her visit to Leuchars, reported here.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News

THE QUEEN AT LEUCHARS

FOR her visit to Royal Air Force Station Leuchars on June 4 to present a Standard to No. 43 Sqn., Her Majesty the Queen, accompanied by the Duke of Edinburgh, travelled from Marham, Norfolk, in a Comet 2 of 216 Sqn. Transport Command. Both Her Majesty and Prince Philip spent periods in the cockpit of the aircraft, the captain of which was S/L. C. J. Harper.

Senior officers who met the royal visitors on their arrival at Leuchars included Air Chief Marshal Sir Dermot Boyle, Chief of the Air Staff; Air Marshal Sir Thomas Pike, A.O.C-in-C. Fighter Command; A.V-M. W. G. Cheshire, A.O.C-in-C. No. 13 Group, and G/C. D. F. Beardon, the Station Commander.

In presenting the Standard, the Queen said that No. 43 Sqn. had been formed 41 years ago and that, although there had been two periods of disbandment, it could boast of 34 years' flying—"a record of which you may be justly proud and which few other squadrons can equal." The unit had led the way in developing the technique and art of the branch of air warfare to which it was related; it was among the first to be equipped with Hurricanes and the first to fly the Hunter. "I am confident," added Her Majesty, "that if the need to fight arose you would be worthy of the great deeds done by your predecessors."

The Queen talked with No. 43's C.O., who is Major Ray O. Roberts, a U.S.A.F. officer on exchange posting.

During their tour of the station the royal visitors entered a hangar in which was a Javelin armed with the de Havilland Firestreak, and where an example of the ground-to-air Bristol Bloodhound was also on view. Among aircraft brought to Leuchars specially for the occasion were an English Electric P.1A and a Fairey Delta 2. During the afternoon Her Majesty reviewed a line-up of Hunters and Venoms and afterwards watched a flying display which included a fly-past by Javelins.

Her Majesty looks into the cockpit of an F.D.2 (right) and a P.1A (below). As shown on an earlier page of this issue, she also inspected guided weapons.

The R.A.F.A. Conference

IT was Torquay's turn this year to provide the venue for the annual conference of the Royal Air Forces Association, and it was a happy choice. The setting was perfect and the organization as faultless as usual.

Marshal of the Royal Air Force Lord Tedder (president of the Association) was in the chair and with him on the platform was the national council. Many members of the council, incidentally, have given their services over a very long period. Dame Helen Gwynne-Vaughan has been a vice-president and elected member since 1941; Air Marshal Sir Robert H. M. S. Saundby has been chairman since 1946; and Dame Katherine Trefusis-Forbes (a vice-president) has been associated with the R.A.F.A. since 1939 and G/C. R. C. Vaughan (chairman of both the National Executive Committee and Law Sub-Committee) since 1945. (Chairmanship of the law sub-committee is no sinecure; the legal panel of the R.A.F.A. can call upon the services of 30 barristers and 290 solicitors, who handle more than 600 cases a year.)

As was expected, the main interest of the conference revolved round further economies found necessary concerning adminis-

SERVICE AVIATION . . .

"They shall grow not old . . ." Standards of the R.A.F.A. branches dipped in memory of the fallen at the memorial service held at the Association's Conference at Torquay. (A report begins on the previous page.

tration funds, and the wise spending of money available in the welfare account.

First resolution on the agenda, in accordance with tradition, dealt with pensions and asked for endorsement of actions already taken by the national council in supporting other ex-Service organizations in their demand for improvements in war pensions. Under five separate headings the resolution called for a minimum basic pension of £4 10s a week; the right of independent appeal against decisions of the Ministry of Pensions; the provision of two-seater invalid carriages where wanted; improvements to certain widows' pensions; and a request that disability pension up to half of the 100 per cent pension rate and 10s 6d of a war widow's pension should not be taken into account by the National Assistance Board.

The resolutions drew much heartfelt comment—including comparisons between the refusal of £4 10s per week for 100 per cent disability and the recent suggested legislation raising the salary of Members of Parliament to £1,750; it was carried unanimously.

Heading the list of "welfare" resolutions was one sponsored by the national council asking the conference to agree to the provision of a home to be set up for aged ex-R.A.F. and W.R.A.F. personnel. This was to form the main outlet for the extra funds provided by "Wings Days."

Despite persuasive comment from the platform, by Mr. Jago and Dame Helen, the resolution aroused opposition from the floor. It was lost, to be replaced by a subsequent proposal (sponsored by Sale and the North Western Area) to authorize the acquisition of a property at Ambleside, offered to the Association by the National Trust for use as a convalescent home at a peppercorn rent. Although it was pointed out that expensive reconstruction would be necessary the resolution was carried.

When the section dealing with administrative finance came up for consideration G/C. Vaughan made an earnest speech appealing for economy and new sources of revenue. The Association's chief worry is the reduction in the amount that the Air Ministry can in future grant from the R.A.F. Central Fund. In the last financial year it has fallen from £10,000 to £7,000, and it is thought possible that this valuable source may disappear entirely. An increase in life membership subscriptions was agreed to.

An item of organization, tied in with finance, was the resolution worded "This conference again confirms its satisfaction with the present form of area organization." The names of no fewer than 13 branches appeared as sponsors. The resolution was carried, but in the discussion another battle developed between floor and platform. Delegates were jealous of the degree of area autonomy at present enjoyed, while the council thought that considerable savings were possible with some measure of re-centralization.

An interesting resolution to which the conference agreed was one put up by Letchworth. This was a scheme whereby all members of the R.A.F. would be automatically enrolled in the Association from the date they left the Service until the end of the same year.

Awards this year were presented as follows:—

Shell Mex trophy for area membership—won outright by the Welsh Area and re-presented by them for competition under more stringent rules; Wings Day trophy (highest net collection per head of membership)—Ballymena, £11 6s 10d; Wings Day trophy (highest net collection)—Newcastle-on-Tyne, £1,090 5s 8d; Battle of Britain trophy (highest net collection per head of membership)—Jersey, £16 14s 4d; Battle of Britain trophy (highest net collection)—Jersey, £3,360 6s 3d; Overseas Battle of Britain trophy (highest net collection per head of membership)—Hong Kong, £78 18s 11d (total collection, £3,000); Overseas Branch Membership trophy (percentage increase)—Singapore, 103.84 per cent; Branch Efficiency award—Ulverston.

Out of a total of 766 branches, 359 were represented, with a voting strength of 57,340. At the close of the conference the delegates rose to show their appreciation of Lord Tedder's agile and pleasant handling of the function. Next year's conference will be held at Edinburgh.

IN BRIEF

The Under-Secretary of State for Air, Mr. Charles I. Orr-Ewing, is due back today, June 14, from a tour of R.A.F. units in the Mediterranean area. On June 6 he attended the presentation of a Standard to No. 32 Sqn., which, flying Gauntlets in experiments in November 1937, made the first radar interception.

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Air Chief Marshal Sir James Robb has retired from the chairmanship of the R.A.F. Benevolent Fund's grants committee and from the finance and general purposes committee.

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Three R.N.Z.A.F. pilots in Malaya, F/O.s T. W. Evans, J. C. Priest and L. D. Cowper, are in their spare time acting as honorary instructors at the Royal Singapore Flying Club.

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In England since June 8 for a series of concerts, the Central Band of the R.C.A.F. leaves next Monday, June 17, for a tour of the Continent.

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Guests of honour at a luncheon given by the Paris branch of the R.A.F.A. during Aero Show week were Mr. Cyril Birks (public relations adviser to the Association) and Mrs. Birks. A. Cdre. C. A. Lockett, British Air Attaché, was among those present.

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An R.A.A.F. officer, S/L. D. W. Hitchins, has been appointed to command No. 24 (Commonwealth) Squadron. He has been serving as a staff officer at the Department of Air, Melbourne, and in his new appointment will be on exchange with the R.A.F. for two years.

Vintage generation: ex-members of the R.F.C. present at the R.A.F.A. Conference. Those seated, left to right, are Mr. K. T. Jago, Air Chief Marshal Sir Frederick Bowhill, Marshal of the R.A.F. Lord Tedder, Air Marshal Sir Robert Saundby and G/C. R. C. Vaughan.

The Aer Lingus 21st birthday celebrations were brought to a close on June 3 at Collinstown Airport, Dublin, by a Blessing of the Fleet. The service is here seen in progress.

CIVIL AVIATION

BRITANNIAS FOR CUBANA

THE fourth export order for the Bristol Britannia 310-series was announced on June 5. It comes from Compañia Cubana de Aviacion, the Cuban airline which operates domestic and international services in the Caribbean and to America and Europe, and which owns three Viscount 755s. Their Britannias will be of the long-range 310-series, with Proteus 755s, and are scheduled for delivery "towards the end of 1958." Cubana intend to operate them on their services to New York and Europe, the latter service being *via* the Azores to Spain.

The latest order brings the official total of Britannias sold to 68. The order for two 302s from Aeronaves de Mexico may be confirmed if and when the airline is awarded—as seems likely—a new route from Mexico to New York.

VISCOUNT TOKYO SERVICE POSTPONED

HONG KONG AIRWAYS, who were to have inaugurated their Viscount service between Hong Kong, Taipeh (Formosa) and Tokyo last Saturday, announced last week that the service was being postponed. The airline, which at present operates two Viscount 760Ds between Hong Kong and Manila, Okinawa and Seoul, say that the postponement is "for a short period." There is apparently no question that the hold-up is due to the political situation in Formosa: the announcement from Hong Kong says that the postponement has been made pending clarification of the airline's operating position at intermediate points on the route.

A.N.A.-T.A.A. MERGER?

IT is understood that Australian National Airways have asked the Australian Government to take them over. The government is said to be prepared to do so, the only point in dispute being the price. A.N.A. have asked for £A15m (£12m sterling), but the government are not prepared to go beyond £A10m.

A.N.A. have been finding it increasingly difficult to compete with the government-owned T.A.A. Withdrawal by A.N.A. would leave the field open to government monopoly. The chairman of Trans-Australia Airlines, Mr. W. D. McDonald, said in Sydney that his company is not interested in a merger with A.N.A.; it was his opinion that the high standard of Australian air transport had been attained by competition.

The Lion of Judah denotes that this Constellation 749 belongs to Emperor Haile Selassie of Ethiopia. It was photographed at London on its delivery flight to Addis Ababa. It is fitted, according to the original caption, with a "sumptuous removable stateroom."

SOUTH AMERICAN WAY

THREE years after the cessation of their services to South America, B.O.A.C. are re-examining the prospects of reopening this route. A B.O.A.C. survey party under Mr. Winston Bray, the commercial planning manager, left for South America last Monday to visit Rio de Janeiro, Sao Paulo, Montevideo, Buenos Aires and Santiago. In a statement made last week, Mr. Basil Smallpeice, B.O.A.C.'s managing director, said that this was a fact-finding tour and that it was not possible for the Corporation to say when they would be in a position to resume services.

B.O.A.C. services from London to Rio, Montevideo, Buenos Aires and Santiago ceased in April 1954 when the Argonauts were required to supplement the fleet depleted by withdrawal of the Comets. Commenting upon the expedition, Mr. Harold Watkinson, Minister of Transport and Civil Aviation, said last week that "The long-range Britannia was ordered for this service as well as the North Atlantic and it seems an appropriate time . . . to send out one or two experts."

COACH AIR TO NICE

WHEN Skyways announced their Everyman Coach Air service to Nice earlier this year, they hoped to be able to offer fares of under £20. This would have been very little dearer than the cheapest train and boat fare and, in view of the competition to French railways there were objections from the French Government. French clearance for Eagle's "Spanish Eagle" service to Perpignan was also severely limited.

Asked about these objections and about the steps that had been taken to "protect our rights," the Minister of Transport and Civil Aviation, Mr. Harold Watkinson, said in the House of Commons last week that "the facts are that British airlines want to make much greater use of French airfields than French airlines want to make of British airfields." Vigorous representations had been made, and "the French Government had been quite reasonable in their attitude."

Skyways have now received permission to operate their coach-air service to the Mediterranean as from June 20. The inclusive "lowest approved fare" from the centre of London to the centre of Nice will be £24 10s—very low, but not as low as they would have liked. The service will operate four times a week with 36-seat DC-3s.

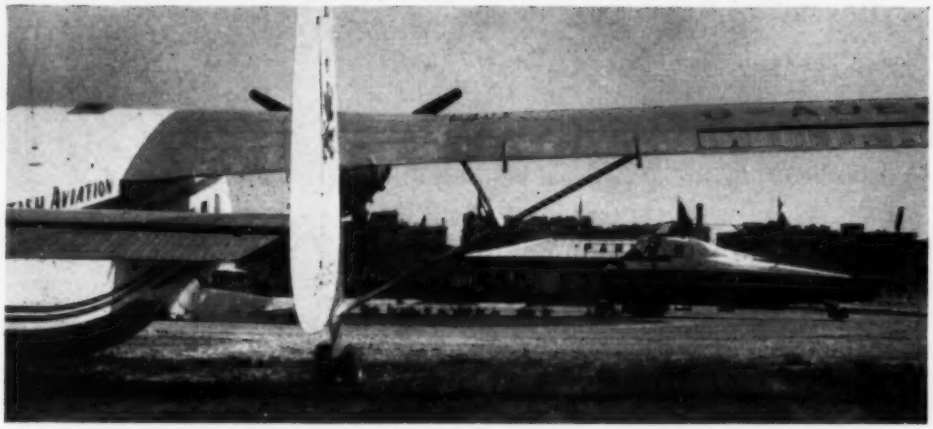
ON NOT SHOWING THE FLAG

THE decision of B.E.A. to adopt more neutral covers for its tickets, timetables and literature by removing the Union Jack provoked an extraordinary outburst of protest. Much of it must have been considered rather shrill by true adherents to the British flag. Among these may be counted B.E.A., who show the flag abroad (painted on the fins of their aircraft) in the most practical way imaginable.

This comment came from B.E.A.'s chief executive, Mr. Anthony Milward, in a letter to *The Times* on June 6: "There must always be, from time to time, countries—of which the Near East is at present a good example—who do not appreciate literature sent to them embodying the Union Jack. Our expensive timetables, instead of being prominently displayed, are either thrown away or placed in the background behind our competitors' publications.

"The commercial consideration is, therefore, the only explanation of our so-called 'embarrassment', and . . . our decision to follow the general practice adopted by the airlines of the world of using more neutral material for our publication is dictated solely by commercial motives."

For the first time, the claim that the Twin Pioneer can compete with the helicopter in city-centre services was put to the test during the Paris Salon. The operation was a great success for Scottish Aviation's aeroplane, seen here at Issy-les-Moulineaux before take-off for Le Bourget. Beyond is a Sabena S-58 just in from Brussels.



CIVIL AVIATION . . .

INFORMATION LINK

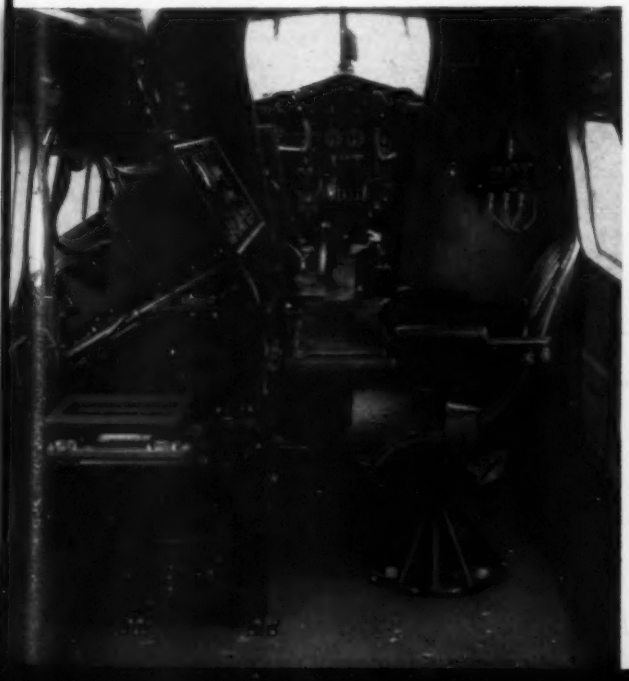
ANY means of simplifying the task of the air traffic controller and reducing voice transmissions is certain to arouse interest. Stromberg-Carlson, a division of the General Dynamics Corporation, are reported to have evolved a system called L.A.B.I.L. (Light Aircraft Binary Information Link) which is soon to be demonstrated in England. Information concerning identification, departure point, destination, E.T.A., present position, altitude, airspeed, time of report, heading, flight time remaining and other data is fed into the airborne unit by the pilot through selectors. On a request for information from ground control a transmitting key is pressed and the information goes to the controller *via* the aircraft's voice-communication radio. It is then filtered through an error detector and printed by teletypewriter as a single horizontal line of type-script. Failure of information to pass the error check is indicated by a blank space.

I.C.A.O. AIRPORT RECOMMENDATIONS

AT the conclusion of its five-week meeting in Montreal, I.C.A.O.'s aerodromes, air routes and ground aids division issued a report which included the following points: (1) A reduction in the width-requirement for Class A and Class B runways from 200ft to 150ft would be acceptable; and a width of 75ft was proposed for taxiways. (2) Paved "sideways" should be provided to prevent podded jet engines (which may overhang the sides of runways) from sucking in stones and debris. (3) Recommendations would be made for the adoption of a standard method for calculating the bearing strength of runways—thus avoiding the confusion which results from the many different methods of estimating pavement strength requirements.

A 50ft reduction in the acceptable runway width will come as a disappointment to I.F.A.L.P.A., who have been pressing for the full 200ft requirement. The slightly asymmetric effect of reversed thrust from braking propellers, they say, may cause piston-engined aircraft to swing off the runway centre-line; the frequency with which runway marker lights are fractured is eloquent testimony to the need for greater width. But the Association's main case for a 200ft runway width is based upon the low-speed handling characteristics of swept-wing jets in a cross-wind. They quote the case of an aircraft that is aligned with the runway by kicking-on rudder. The wing on the cross-wind moves forward, increases its lift and rolls the aircraft. To pick up the dropping wing may be a difficult operation in a cross-wind.

I.F.A.L.P.A. also raise the problem of landing jet aircraft on icy runways. They claim that jet reverse thrust is too sluggish to straighten a skid and that this is a further reason for allowing a reasonable margin of paved surface.



BREVITIES

THE first regular service to be operated by B.E.A. to Eastern Europe left London for Belgrade on June 2, carrying Earl and Countess Attlee. The service is operated twice weekly by Viscount 700s *via* Zurich.

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Ghana became the seventy-first member-state of I.C.A.O. on June 7.

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The Brazilian airline REAL has ordered four Lockheed L.1049H Super Constellations.

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Garuda are to open a new service from Djakarta to Calcutta *via* Rangoon.

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C.P.A.L. say that they will introduce their Britannias on the polar route in January.

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East African Airways are to start a new Canadair service between Nairobi and Bombay on September 15.

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Lufthansa are to operate a Metropolitan service from Germany to Dublin through Manchester in September.

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Viscount 800s have now taken over three of B.E.A.'s routes: London - Brussels (Elizabethan), London - Zurich (Viscount 700), and London - Dusseldorf (Elizabethan).

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Sir Leonard Isitt, chairman of T.E.A.L., has said that the airline will re-equip with turbine airliners during the next three years to replace the DC-6 fleet. Six types are being reviewed.

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An announcement by Sud Aviation, quoted recently on the French radio, states that Mr. Howard Hughes has offered to "mass produce" the Caravelle.

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Following the Air Ministry's decision to de-requisition the aerodrome, the Leeds and Bradford Joint Aerodrome Committee have announced that they intend fully to develop Yeadon as an international airport. Certain foreign airlines, including Sabena and Aer Lingus, are said to be interested in the possibility of using it if the intended developments are carried out.

Here is the interior of the first D.H. Heron to be equipped for airport radio calibration work. This particular aircraft, VP-KVC, has just been delivered to Nairobi for use by the East African D.C.A.

Outside the West London Aero Club at White Waltham: Competitors J. R. S. Overbury, J. Pothecary, C. A. N. Bishop, P. Langstone, Margot McKellar, M. J. C. Odell, D. McD. Hartas, D. W. Phillips, C. Boddington. (Right) Winner D. W. Phillips.

Whitsun in the Air

TIGERBATICS AT WHITE WALTHAM

R.Ae.C. Curtain-Raiser for Next Month's International Competition

IN these days of sophisticated entertainment one might be excused for wondering whether nine ancient Tiger Moths in an aerobatic competition would provide an afternoon's amusement—particularly as rain was still falling at lunch-time. But the flying club spirit is as old and well-established as the Tiger Moth; at White Waltham on Whit Monday everyone seemed well content and at the last moment the sun burst through.

The competitors in the Royal Aero Club's aerobatic competition could not easily be classified; their experience varied from 150 hours to over 10,000 and one was a woman. The intention was to encourage the art and foster British participation in international events. Clearly, some British pilots are getting a little rusty in light aircraft aerobatics—so different from the jet stuff in which we excel. It seemed a pity that only Tigers took part.

Lots were drawn for order of take-off and each pilot had five minutes for display. Manœuvres which had to be included were a slow roll, a loop and a roll off the top. Points were given for scope, accuracy, artistry and positioning and originality, at the rate of 25 each, maximum height (with London Airport near) was 2,000ft, minimum 100 metres (328ft) for safety.

The judges were all experienced pilots: G/C. Gordon Slade, Mr. Hubert Broad, Mr. Jeffrey Quill, Mr. Turner-Hughes and Maj. Oliver Stewart. After the event the cheques were presented by the governing director of Automotive Products Co., Ltd., Mr. W. Emmott. The company also sponsors the annual Lockheed International Competition.

Tiger Moth G-ANSH had been modified for inverted flying and was used by three of the competitors. The winner used an unmodified machine, G-ANZZ. All the others were also quite standard except for G-AHRC, which had a Fairey metal propeller.

There was little doubt as to the winner. When, after noting the details of the sixth display, we wrote after D. W. Phillips "quite the best so far," we reflected also the views of the judges. As an Airwork captain, David Phillips has 10,000 hours. His slow rolls were very smooth and his variety of manœuvres wide. He also kept in the centre of the sky and held his height well. He is a member of the Tiger Club, one of whose aircraft he flew. His prize, given by the Lockheed company, was a cheque for £100.

Second came Chris Boddington from the Northants Club at Sywell. He has only 190 hours, but recently won the D.H. aerobatic competition. By occupation he is a television service manager. Of his display we wrote "smooth, well controlled rolls-off-the-top; good positioning; slow rolls started better than they finished." He received £75.

Third man was Pete Langstone, ex-R.A.F. (600 hours) and at present a student. We liked his slow rolls but, frankly, had two others placed above him in our private estimate. His prize was £50.

Finally, winning £25, came veteran pilot C. A. Nepean Bishop in fourth place.

Those who were not so lucky on this occasion, in order of take-off were: Miss Margot McKellar, indoor gardener and secretary with 150 hr; and Messrs. J. R. S. Overbury, Saunders-Roe assistant chief test pilot; John Pothecary, commercial pilot; D. McDonell Hartas, first officer with B.E.A. on Elizabethans; Mike Odell, on the staff of the Royal Mint (whose display we ourselves placed quite high).

The first three receive in addition to their prizes a free entry from the R.Ae.C. for the Lockheed International Aerobatic Competition which is to take place at Coventry on July 12-13. For this six entries have been accepted to date, including three from Czechoslovakia and a Spaniard.

DOUBLE EVENT

S.S.A.F.A. Twin Displays in Lancashire

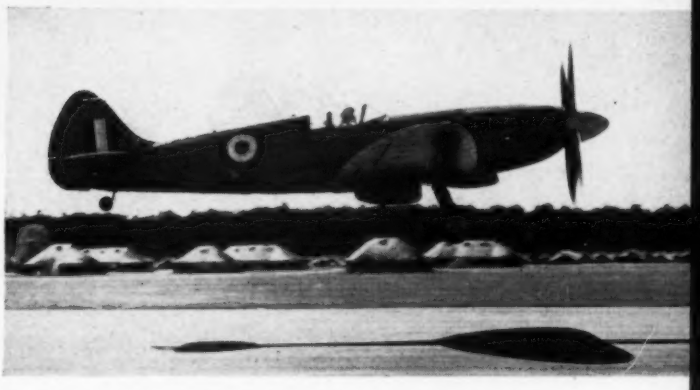
IN the North-West, S.S.A.F.A. organized twin displays at Squires Gate and Woodvale, each group of demonstrators making an appearance at both airfields. Though this was not altogether in the interests of the timetable, the entertainment was very well worth seeing and drew large crowds at both places. The programmes included everything from a good V-bomber beat-up to a frisky fly-past by the Bristol Fighter from the Shuttleworth collection. There were formation aerobatics a-plenty provided by the superb No. 111 Sqn. team, by Naval Sea Hawks from Lossiemouth and by four Provosts from C.F.S. The last-named gave a very fine performance which was the more impressive because the art of piston-engined aerobatics is so different from that in jet aircraft. Earlier, in the morning, a Spitfire made the last strictly operational flight by the type—a met. sortie from Woodvale (further details next week).

Proceedings were opened at Woodvale by a Valiant which arrived on time to the second (as Valiants always do) and gave a more enterprising show in this hard-to-demonstrate machine than we have seen outside Farnborough. S/L. Spencer, of No. 90 Sqn. the aircraft commander, first made a dummy approach and overshot into a tremendous zooming climb at full power. He then showed the slow-speed capabilities of his machine and ended with a very fast low pass.

Manchester University Air Squadron put on a masterful pupil-and-instructor act in two Chipmunks, with "Cadet Pilot Dimclot" making a most skilfully appalling hash of his sortie. Not to be outdone, three Chipmunks of the Liverpool U.A.S. set to and bombed a fleeing truck with flour-bags. They missed, but only just; and signed off with the release of an unmentionable length of paper and one of the "bombardiers" standing erect at the salute in the back seat.

Four Sea Hawks of No. 738 Sqn., Lossiemouth, took off in box for a

All the aircraft competing at White Waltham were Tiger Moths; this one was being flown by C. A. Nepean Bishop. Working out results are: (left to right) Messrs. Turner-Hughes, Jeffrey Quill and Gordon Slade; in the background, Mr. J. B. Emmott and Mr. W. Emmott of Automotive Products Co., Ltd., and Mr. S. Scott-Hall.



At the S.S.A.F.A. displays: Prince Cantacuzene inverted in his Jungmeister. It now has a 275 h.p. engine. Upper right) Two U.S.A.F. RB-66Bs making a very fast low pass in close formation. (Lower right) The Spitfire 19 which made the last strictly operational flight by the type. The engine is the last unused Griffon 66 in Britain.

formation aerobatic session and gave good promise of a fine show, but two of them touched wing-tips during a loop through a patch of cloud. Luckily neither seemed seriously damaged, but they left the formation and the remaining two put on an excellent show by themselves.

Prince Cantacuzene, long absent from British skies, brought his Jungmeister over the airfield in a startling series of zooms and low-level flick rolls. He now has a 275 h.p. Lycoming engine.

A Beverley steamed in and disgorged some 90 men, including a complete military band, of the 5th Battalion the Loyal Regt. Spitfire, Mosquito, Bristol Fighter and a Hurricane were joined in the "old brigade" by a Meteor 8. Jack Aked aerobatted a Slingsby T-21B glider and two Gannets showed their seemingly endless list of configurations. A Whirlwind offloaded six soldiers by rope and winched two of them aboard again. More sprightly, but equally familiar, was an Army Sycamore. Four Canberra B.2s of No. 44 Rhodesia Sqn. put on a finely co-ordinated show which ended with the firing of many Very lights and a zestful bomb-burst. Two U.S.A.F. RB-66Bs flew past very fast indeed in close formation—a taste of their operational habits, which few recognized or appreciated. Parachuted from a Rapide, a dummy of cartoon-character Flook touched down and was dragged by the wind into the public enclosure where, apparently, it was immediately torn to pieces.

Highlight of the show was undoubtedly the five-man team of No. 111 Sqn. in their Black Hunter 6s. They brought their own commentator, a red-bearded Naval aviator on exchange duty. Their show was faultless, formation changes becoming more and more frequent till they rarely seemed to stay put for more than a few seconds at a time. They were fully up to their Paris Show standard. But the four C.F.S. Provosts ran them a very close second for skill and prevision. Rolls in box and formation changes in loops were executed in slow time to the snarl and buzz of the Leonides engines. It was a most satisfactory performance.

DUTCH DISPLAY

Variety and Showmanship at Ypenburg

IN spite of a wet dose of English weather brought over by the Hunter aerobatic team of 93 Squadron, R.A.F., the Whit-Monday display organised by the Royal Netherlands Aero Club at Ypenburg proved well up to the expected ILSY standard in variety and showmanship. No fewer than five of Europe's best aerobatic teams took part in a programme which included also balloon ascents, parachute drops, sailplane demonstrations and a bright miscellany of individual aircraft turns.

The Ypenburg display, which will be fully reported and illustrated in next week's issue, this year celebrated the fiftieth anniversary of the Royal Netherlands Aero Club. Appropriately, the opening items included several with an historical emphasis. Particularly noteworthy were flying contributions by the 1906 Danish Ellehammer, the 1909 Bleriot XI and a surprisingly aerobatic Avro 504K from Old Warden.

Among the many aspects of aviation on show were light aircraft, agricultural flying, Naval aviation, flying training and helicopter operations, in addition to novelties such as the inverted flying of Biancotto in the Stampe-et-Renard Monitor and a brief appearance by the RW-3 auxiliary powered sailplane. If bouquets are acceptable, we award ours to the Solo Hunter of 93 Squadron and, for team aerobatics, to the mighty Skyblazers.

IRISH ENTERTAINMENT

Leinster Aero Club's Well-attended Two-day Display

THE third annual Air Display (held by the Leinster Aero Club) took place at Weston Airfield, Leixlip, near Dublin, on Whit-Sunday and Whit-Monday. As a graceful and appropriate gesture to the pioneer work of Aer Lingus in furthering aviation in Ireland over the past 21 years, Mr. Patrick Lynch, chairman of Aer Lingus and Aer Rianta, was invited to inaugurate the meeting on the Sunday; and as a logical sequence an Aer Lingus Viscount gave a full demonstration.

A display of aerobatics by a Leinster Aero Club member flying a D.H.82 Tiger Moth was followed by the highlight of the show in the form of G-AKTW, the Westland Aircraft Company's Widgeon, flown by Jack Frazer, a company test-pilot, who demonstrated its hovering abilities and manœuvrability to the crowd of about 25,000 Dubliners.

The sound of the Merlins of three Spitfire T.8s of the Air Corps (leader, Capt. Young) brought back nostalgic memories to many of those present as the section smoothly commenced their sequence of all the old Spitfire tricks-of-the-trade; then the well-synchronized evolutions of the only two-seater Spitfires in service in the world gave way to the unusual act of Mlle Andrée Jan, who gave an awe-inspiring demonstration of calisthenics suspended from an Agusta-Bell 47G. After these Gallic gyrations came a drop by four members of the Irish Parachute Club.

For the first time since the Aerchór (Air Corps) received their new aircraft, the Irish public were able to see how well the Aerchór pilots handled their new D.H. Vampire T.55s, two of which gave a neat and very polished display of C.F.S.-type aerobatics. As a contrast "Monkey" Morgan, D.F.C. (of Irish Air Charter) flew the Piper Apache, and the Marquess of Kildare displayed his new Piper Tri-Pacer.

Next was illustrated the rapidity with which the Widgeon can be converted to the ambulance/rescue role. Pat Lucas of Westland acted as "patient" and was "rescued." After this diversion, some skilful "banner-snatching" by veteran Capt. "Darby" Kennedy; then, as a lighter item, one Magillabuggy appeared with his Bedocopter, a weird-looking "flying bedstead" registered EI-DDT. It appeared to be a mixed power machine, using two native propellants—high-test potheen and Lintocolline, for both of which there is a potential export market.

The programme was repeated in its entirety on Whit-Monday, this time before a crowd of about 30,000 and with the good weather holding.

All illustrations on these two pages are "Flight" photographs

The four Provosts from C.F.S. take off for their excellent formation aerobatic display for S.S.A.F.A.

FOLDING TAIL of the prototype Westland Wessex interests Earl Mountbatten during a recent visit to the Westland Aircraft works. With him are Sir Norman Hulbert, a director of Westland Aircraft (hand on hip); Mr. E. C. Wheeldon, managing director (extreme right); Lt. W. H. "Slim" Sear, Westland chief test pilot (behind Earl Mountbatten); and Mr. D. C. Collins, works director (in background).

THE INDUSTRY

Bryans Aeroquipment Expansion

CONSIDERABLE reorganization has recently taken place in the business of Bryans Aeroquipment, Ltd., of Willow Lane, Mitcham, Surrey. Mr. J. R. Bryans has taken over the chairmanship of the company in the room of Major C. E. Stearns and is for the time being retaining the joint managing directorship with Mr. Derek H. Broome, M.A., who joined the firm last January and was elected to the Board in April.

Mr. Broome served his apprenticeship with Rolls-Royce, served during the war with the Fleet Air Arm, and was subsequently employed for some years by I.C.I. and then by Tube Investments.

Mr. A. Bodley Scott, A.M.I.E.E., D.F.H.(Hon.), who joined the company in April as research and development engineer, has taken over research and development activities from Mr. Austin, who remains design director.

Mr. Scott was originally with G.E.C. on design and development of telephone and V.H.F. communications equipment and electronic test gear, and later joined the Ministry of Aircraft Production to work on radar control and gyro-stabilized gun-sights. His last appointment was with the Royal Naval Scientific Service, where he was engaged on specialized work that included the development of control and stabilization systems for guided weapons.

A new laboratory is being set up at the company's Mitcham factory to cover work in the normal fields in which Bryans Aeroquipment has been engaged over the past eighteen years; it will undertake, in addition, more advanced electrical work and development of electronic apparatus.

A new block being built at No. 1 Willow Lane, about 150 yards from the factory, to house office staff and design and drawing office personnel, is expected to be completed this month.

Non-ferrous Alloy Processing

A MAJOR programme of factory and office expansion has been undertaken by the Phosphor Bronze Co., Ltd., at their Bedford Street, Birmingham, works. The company, founded 80 years ago and now a member of the Birfield Industries Group, has found greater production capacity necessary by reason of its steadily increasing order-book, which already numbers some 12,000 customers.

Flexibility in production, now facilitated by the extensions, is particularly necessary for the company's products, which consist primarily of ingots and castings in materials including phosphor-bronze, gunmetal, aluminium and manganese bronzes, Monel, nickel and anti-friction white metal. This work is supplied in as-cast, rough-finished or machined forms. The last-named, in particular, have necessitated considerable extensions of the machine shops. Casting techniques include the shell-moulding and centrifugal processes.

We hope to publish a further note on this company's products, particularly for the aircraft industry, in a future issue.

Plate-stretching Equipment

A CONTRACT for the supply of the very large plate-stretching machine to be installed by James Booth and Co., Ltd., of Birmingham (manufacturers of Duralumin and other non-ferrous alloys) has been awarded to Fielding and Platt, Ltd., of Gloucester.

The new equipment will enable plates exceeding 200 sq in in cross-section to be stretched, compared with a maximum size of about 65 sq in by existing equipment. The purpose of the stretching process is to free the plates from internal stress induced by heat treatment, and so to ensure that they do not distort when they are machined. The process is of particular importance in the supply of large, thick plates to the aircraft industry for use in integrally machined structures.

CLUB AND GLIDING NEWS

SOME 60,000 people from the West of Ireland attended Shannon Aero Club's display on May 26, which was opened by Mr. Sean Lemass, Minister for Industry and Commerce. The programme included formation aerobatics by Vampire T.55s from the Air Corps base at Baldonnel, a gliding display by Dublin and Limerick Gliding Clubs, parachute drops, formation flying by Spitfire T.8s and solo aerobatics by a Provost T.51. In addition to a demonstration by an Aer Lingus Viscount, there was a large static display by nine of the international airlines using Shannon Airport, by the Air Corps and by the Irish Tourist Board.

ANNUAL general meeting of the British Women Pilots' Association is to be held at the Kronfeld Club, London, at 7 p.m. on Friday, June 28. This is to be followed by a week-end flying meeting on July 6-7.

SOUTH Ruislip Aero Club, whose Cessna 170/172 appeared at the Elstree display on May 25, operates in addition four Aeronca Champions and one Piper J.3 Cub. Membership, composed of U.S. Servicemen and civilians in the London area, totals about 100 at present. Bovingdon has been the club's base; a move to Booker is now under negotiation.

UNTIL recently chief flying instructor of the Orkney Flying Club, Mr. Robert Learmonth has now joined the instructional staff of the Blackpool and Fylde Aero Club, which operates no fewer than seven different types of aircraft. Soon to be added is an eighth type, a Chipmunk. Flying rates of £3 12s 6d and £3 7s 6d are likely to be decreased in the near future, following good utilization of aircraft. C.F.I. at Blackpool is Mr. Eric Hustwayte.

AN early-morning flight from Croydon to Bembridge, Isle of Wight, is being planned by the Surrey Flying Club for Sunday, July 21. Take-off is at 8 a.m., with breakfast on arrival at Bembridge. The first A.B.A.C. scholarship lottery is to take place at the Surrey Flying Club at 3 p.m. on Saturday, June 22.

TWO important new developments at Denham Flying Club are (in the order given in the club's latest newsletter) firstly, the construction of a new bar and, secondly, the installation of a 123.5 Mc/s radio facility. Vernon Smith is in charge of the former, M. H. Redfern the latter.

RECENTLY elected to associate membership of the British Gliding Association were the Cornish Gliding Club, Perranporth; the Crown Agents Gliding Club, Lasham; and Taunton Vale Gliding Club, Dunkeswell.

A NEW type of lightweight oxygen set, marketed by British Oxygen Aro Equipment, Ltd., is to be used for the first time during the National Gliding Championships. The set weighs under 10 lb, is based on the Aro A-12A diluter demand oxygen regulator, and will be fitted in the Skylark 3 to be flown by David Ince, the company's sales manager.